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NATURAL HISTORY

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No. 22—*January* 1839.

I.—*Fourth Report of Progress made in the Examination of the* MACKENZIE MSS., *with an Abstract Account of the Works examined.—By the Rev.* WILLIAM TAYLOR, *Member of the Madras Literary Society, &c. (Continued from the last No.)*

B :—TELUGU.

a. Palm-leaf Manuscripts.

The following manuscripts are portions of a version of the *Mahabhárata.*

Adi-parvamu, or the first book of the *Bhâratam,* No. 1.—Counter-mark 161.

This copy contains from the beginning down to the 241st palm-leaf, without intermediate defect; but all the remainder is wanting. The manuscript is very old: the hand writing somewhat antique; and the leaves are damaged, in several places, by the eating away of the edges; so that portions of the nearest line have words eaten out.

2. *Adi-parvam,* No. 2.—Countermark 162.

This copy is complete at the beginning, and down to the 208th palm leaf; the remainder is wanting. It is a comparatively recent copy; but the leaves are perforated by insects in several places; so as occasionally to destroy some letters, but not so as to destroy legibility.

3. *Adi-parvam,* No. 3.—Countermark 163.

This copy wants the 1st leaf, it is then right down to the 22d leaf; deficient afterwards to the 190th and thence to 114th; right afterwards to the 144th: so far very old. A more recent hand writing follows, beginning with the 185th leaf; right thence to 188. No. 189 is wanting. From 190 to 214 is right; defective to 217; right thence to 227. No. 228 is wanting; thence right to 226, defective to 242, right thence to 245, and defective to 254. The remainder complete down to 288, the end.

This manuscript is very old. The former portion more so than the other, which is in a different hand writing. It is also damaged; not so much by insects, as by the wear and breaking of the leaves by decay.

4. *Adi-parvam,* No. 4.—Countermark 164.

Of the eight *asvásams* (or sections) into which this *parvam* (or book) is divided, there are in this copy the 5th, 6th, 7th and 8th: there are nine leaves wanting from the beginning of the 5th: the other sections specified are complete. The leaves were not numbered; causing so much the more trouble in the examination: the Nos. of the pages have been inserted; and the contents compared with another copy, not belonging to this collection.

This MS. (No. 4) is but lately written; both palm-leaves and hand writing being quite recent in appearance.

5. *Sab'ha parvam,* or the second book of the *Bhàratam,* No. 5.—Countermark 265.

In this MS. the 9th palm-leaf is wanting; thence it is complete to the 59th leaf, which is the end.

This copy is very old; injured at the edges, but not inside.

(The third book, or *Vana parvam*, is not in the collection).

6. *Viráta parvam*, or the fourth book of the *Bhâratam*, No. 6.—Countermark 266.

The beginning is found in this copy to the 20th leaf, with a chasm thence to the 50th leaf. Thence right to the 146th leaf. The MS. is old; though apparently not quite so old as the last. It is a little worn at the edges; and very slightly touched by insects inside; neither amounting to injury.

7. *Udyoga-parvam*, or fifth book, No. 7.—Countermark 267.

This copy is complete from the beginning up to the 139th leaf, which is the end; or, in other words, it is a complete copy, save only, that the wearing or breaking away at the edges, and the breaking off of a few leaves inside, occasionally destroys the coherence of the versification, and meaning. The copy is rather old.

8. Another copy of the same, No. 8.—Countermark 268.

This is a recent copy, as to palm-leaves, and writing; but not finished; from the beginning to the 36th leaf is found herein; the rest is wanting.

9. *Bhishma parvam*, or ninth book, No. 9.—Countermark 269.

This copy is right from the beginning to the 89th leaf. There is then a mistake in the numbering of the leaf, 100 being written for 90; but the connection of the composition is uniform. It is then right to 136, the end; by consequence a complete copy, save only that the 21st leaf is broken off, and part of it wanting. The book is slightly worn at the edges, and touched by insects: but these do not affect or injure the meaning. The copy is a little old.

10. Another copy of the same, No. 10.—Countermark 270.

The first ten or fifteen leaves are seriously damaged, by insects. The copy is otherwise complete; containing 146 palm-leaves in all. There is attached a copy, not perfect, of the *Dasarath' sataca*, by *Rama-dasa*, containing a eulogy of *Rama-Chandra* as *Vishnu*, appearing under ten metamorphoses, or incarnations.

Both MSS. are rather old ; and both injured by insects.

11. *Dróna parvam*, or seventh book, No. 11.—Countermark 271.

This copy is complete in 227 palm-leaves; but these are old, especially the first 45 leaves; which are also injured by insects. The remaining, and seemingly more recent, portion, is not touched.

12. *Kerna-parvam*, or the eighth book, No. 12.—Countermark (wanting).

A complete copy in 90 palm-leaves; old, but notwithstanding in good preservation.

A few palm-leaves are appended, containing panegyrical stanzas addressed to the consort of *Siva*.

13. *Kerna-parvam* (another copy), No. 13.—Countermark 273.

This MS. is complete, as regards the *parvam* itself; though the paging is from 2 8 down to 362, as part of a fuller copy of the *Bhâratam*. This copy is a little old; but in very good preservation.

14. Another (imperfect) copy of the same, No. 14.—Countermark 274.

The two first palm-leaves are wanting; but from p. 3 to p. 16, the leaves are regular; the remainder is wanting. A few loose leaves follow, apparently belonging to the *Adi-parvam*, of some copy different from those in this collection. What remains of this fragment is in tolerable good order.

15. *Salya parvam,* or the ninth book of the *Bhàratam,* No. 15.—Countermark 275.

This copy contains from page 138 to 332; the intermediate leaves being regular; and the numbering indicates that the MS. is part of a larger one, since the *Salya-parvam* is herein complete. The manuscript is rather old; slightly worn at the edges; and but slightly touched by insects inside. It may be considered to be in moderately good preservation.

16. Another copy of the same, No. 16.—Countermark 276.

This copy is also complete; though the numbering is from page 363, down to page 507, the end. It is much older than the preceding copy. It is also more worn, and injured inside; particularly in a few leaves at the end; and appears to have formed a part of one entire copy of the *Bháratam.*

17. *Sauptica-parvam,* the 10th book, No. 17.—Countermark 277.

The copy is complete as regards this *parvam* itself: though the numbering of the pages is from 252 down to 296, indicating it, as before, to be a part of a fuller copy of the *Bháratam.* This MS. is a little old, and somewhat worn at the edges; but in good preservation inside.

(The eleventh book is not found in the collection).

18. *Santi-parvam,* the twelfth book, No. 18—Countermark 278.

This copy is complete in itself; but the paging is from 152 down to 348. This MS. is old; worn at the edges; discoloured inside; damaged at the beginning; and more seriously at the end, by insects.

As regards the entire work of the *Mahabhárata,* an abstract of its voluminous, and multifarious, contents will not be expected, or required from me in this place. In the original Sanscrit, especially, it is a work of first rate consequence; and has received, as such, attention from all enquirers into Oriental literature. It is one of the *Itihasas*; and secondary in esteem only to the *Vedas*; in some instances to the *Puranas.* There is much of early history contained in it; though not satisfactory

in character, because fact and fiction cannot be easily disentangled. The Telugu work is a translation from the Sanscrit by *Nannaiya Bhatt*, and his disciple *Balasarasvati*, according to one account; according to another account by *Tikana-Somayáji*, completed by *Potaiya*, or *Bommana-pota-raja*. A third account, that of Professor Wilson, states the translation to have been by *Nannaiya Bhatt*, down to part of the third book; completed by *Tikana Somayáji*. Possibly there are two or three different versions.

It will be seen by attention to the foregoing details, that a complete copy could not be made of the MSS. in this collection, without extraneous aid. The idea of forming such a copy has occupied my mind; but time and expense seem to forbid the doing so; and need does not urge it, just at present; for the copies will not suffer much further injury, for a year or two, and whenever the formation of one complete copy may be attempted, other copies, to collate with these, must be procured. One copy, uniform with the other restored MSS., would probably fill two folio volumes, at least. I have already incurred expenses for restoration of MSS. considerably beyond my allowance for copyists; and the time required to form such a collated copy would seriously interfere, with the successful, and timely, discharge of my obligation in the other, and more important, parts of my engagement. Hence so laborious a work, with regard to one poem (however valuable), is not my present duty. Should any ulterior process arise out of the present examination, I would then recommend the making such a restoration as a good record copy.

The following four manuscripts are portions of a version of the *Bhágavata puránam*.

19. *Panchama-Scandham*, or the fifth book of the *Bhágavatam*, No. 22—Countermark 284.

This is a complete copy of the fifth book of the *Bhágavatam*; but the numbering of the pages, from 221 to 253, shews it to have belonged to a complete copy of the whole work. This MS. is neatly written; is rather old; but in good preservation. The version is poetical by *Bommana-pota-raja*.

20. *Saptama Scandham*, or the seventh book of the same, No. 21—Countermark 282.

This portion is complete, as a distinct book. It is quite recent; slightly touched by insects at the beginning, but of no consequence, as to extent of injury.

21. *Ashta-Scandham,* or the eighth book of the same, No. 23—Countermark 283.

This copy is imperfect, both at the beginning, and at the end. It wants 20 leaves at the beginning, and how many at the end cannot be determined. A recent marking of the leaves in *ink,* would imply a complete work from the 1st page, which is deceptive. The fragment is not very old, as to leaves and copying. It is also but slightly injured.

22. *Dasama Scandham,* or the tenth book of the same, No 21—Countermark 285.

This is a complete copy of the tenth, and also of the eleventh book. The manuscript is neatly written, is not very old, and in perfectly good order.

An abstract of the *Bhagavatam* being in progress, nothing further is here necessary to be added. It may only be expedient to mention, that in Sanscrit, *Candam,* and *Scand'ha* alike denote a book, section, or chapter. The Tamil translator adopted the former word, as better suited to the Tamil orthoepy; the Telugu translator has employed the more usual term, as the Telugu alphabet contains representatives of all the Sanscrit letters and sounds.

22. *Ranganát'ha Ramáyana* a version of the *Ramáyanam* by a *Brahman* named *Ranganát'ha,* No. 99.—Countermark 399.

This manuscript is very old, and exceedingly injured; not so much from the ordinary cause, that is insects, as from wear and tear by use. The leaves are broken off in the middle, a half only remaining; or broken partly, a larger part remaining: many entire leaves are wanting; and the whole so very deficient, that a particular enumeration of defective parts would be equally tedious and useless.

23. Another copy, No. 100.—Countermark 400.

This is a very small, and still more imperfect, manuscript. It wants the beginning, and the ending; is not regular in the middle; and though not so much broken by use, as the last copy, yet is injured in this way, chiefly at the two ends. It is not touched by insects. It does not seem any way possible to form one complete copy from both of these fragments. Being a popular book, it can always be procured, as it is very common northward of Madras. It is the production of the aforesaid *Brahman* composed in the *dvi-pada* measure; and written under the patronage of *Buddhana Siddha-redi*, a chief in the Cuddapah district, who bestowed money very liberally on him. As it is a version from the well known Sanscrit poem, an abstract of the contents is not required.

Note.—Both MSS. are entered in Des. Catal. vol. 1. p. 335. art. 51. One copy is termed incomplete, implying the completeness of the other one; an inference that would be ill founded.

24. *Sarangadhara Charitra*, tale of *Sarangadhara*, No. 61.—Countermark 407.

This is a fragment of a poem by *Chamakuri-Vencatapati*; a work of romance or fiction; the hero being *Sarangadhara* son of *Bhoga-devendrudu*. The incidents are not of a kind to be abstracted here; and I therefore refer to the very sufficient notice of them in art. liv. page 337, vol. 1. of the Des. Catalogue. This fragment has the appearance of being very old, and is a very small part, of what I understand to be properly a large work.

The subject is that of the two Tamil manuscripts, noticed in the foregoing portion of this report. A. *a*. 24 and 25. Nos. 117 and 118.

According to the Des. Catalogue there should be another copy in prose, on this same subject, in Telugu, which manuscript apparently is not now in the collection.

25. *Bhoja-raja-Cheritra*, the tales of *Bhoja raja*, No. 68—Countermark 351.

The book is a fictitious work on the plan of the *Pancha-tantra*, and similar productions. It is not concerning *Bhoja-raja* himself; but the

different tales are represented as having been narrated to him by *Sarpata Siddha.* One of the tales at the commencement relates to a great hunting match, made by a king of the *Anga* country to destroy the wild beasts by the advice of his ministers ; and other tales are of a like artificial structure : the object in view is to teach stratagems, artful devices, and cunning, adapted to outwit others. It is in good Telugu ; but with orthographical faults. The book is complete, and in very good order.

Note.—It is entered in the Des. Catal. vol. 2, p. 321, art. xi. at least I suppose it to be the same work; though in the Catalogue it is stated to be imperfect.

26. *Nala Charitra,* the story of king *Nala,* No. 35.—Countermark 385.

This is an old manuscript. Palm-leaves are wanting from 13 to 28, the remainder continues in regular order forwards; but it is not complete at the end; where besides it is especially damaged. It contains a poetical account of the fortunes of *Nala-rája,* founded on an episode in the *Mahabhárata.* Versions of the tale are found in all the languages of the Peninsula. There is no need of abstracting it here ; and the complete restoration of the manuscript is impracticable, without possessing another copy of the same poem, I therefore pass it by; seeing that the mere local poetry, or *belles-lettres* of any section of the *Hindus,* is not the object of my enquiries.

Note.—It is briefly entered in the Des. Catal. vol. 2, p. 332, art. xxxix. " The story of *Nala* and *Damayanti,* as taken from the *Mahabhárata.*"

27. *Sesha-dherma,* or *Hindu* morality, No. 20.—Countermark 280.

This is a poem divided into seven sections, each one entitled a *satakam ;* the usual name of a distinct work of one hundred stanzas. These sections are as follows:—

1. *Mukti Canda-satakam.*
2. *Parámanda-satakam.*
3. *Rama-shadácshari-mantram.*
4. *Daltátraya-satakam.*

5. *Sampanga-mana-satakam.*
6. *Sesha-dherma.*
7. *Sesha-dherma shashta-másvásam.*

The first contains various formularies used by *Brahmans*, and relates to the qualities of the soul, and especially to the homage paid to *Siva.*

The second is an epitome of the meaning of the *Sastras*, and meaning of the doctrines of spiritual preceptors, still according to the *Saiva* system.

The third contains the various *mantras* on the *Vaishnava* system. The repetition of these formula is marked and numbered by certain gestures on the hands, members of the face, and head; and the repetition, when bathing, and at other times, is a part of the manual, and mental; devotion of *Vaishnava* votaries.

The fourth proceeds on the example of an elephant, when seized on by an alligator, praying to *Vishnu*, who hurled his *Chacra* and killed the alligator: whereon is founded the instruction that votaries who in time of trouble call on *Vishnu* will be delivered, by his sending down his *Chacra*, or effecting some marked interposition, on their behalf.

The fifth contains explanations on the nature of *Vishnu*, as to his spiritual form; the said form pervading the universe. It inculcates truth and spiritual homage, and appears to contain the *esoteric* doctrines of the *Vaishnavas.*

The sixth relates to gift of food, of place, of land, of a cow, &c. with a comparative estimate of the relative value of different donations.

The seventh contains narratives of different individuals; notices of sacred places; special days of peculiar virtue, and merit of bathing thereon; merit of charitable gifts on Sundays and Mondays, as narrated by *Bhishma* to *Dherma raja.*

The first *sataca* contains 196 stanzas, the second 111 stanzas, the third is a continuous series of formularies. The fourth contains 103 stanzas, the fifth 123 stanzas, the sixth and seventh are irregular, and without any specification of number.

At the beginning four palm-leaves are wanting, and I have not the means of restoring them at present. The book is damaged by reason of insects having eat away the edges; forming, so to speak, the small margin, but leaving the writing uninjured. The work is partly compiled from the *Mahabharata*, by *Kondia Srinivasa* who lived in a village of the *Rajahmahendri* district. The leading title of the work is taken from the two last sections. *Sesha* is shortened from *Adi-sesha*, the

thousand headed serpent, on which *Vishnu* is fabled to repose, as some say an emblem of eternity ; and *dherma* is a word which signifies, justice, equity, benevolence, morality, alms, or ritual observance. The reader may thence frame his own translation of *Sésha-d'herma.*

The book is a valuable one. A literal translation would be of great use towards a full acquaintance with the *internal* system of the *Vaishnavas* ; which is not the one commonly inculcated on the people.

Note.—It is entered in the Des. Catal. vol. 1, p. 270, article xii ; with an error as to the contents being derived from the *Bhagavat,* most probably an oversight or misprint, or possibly a mistake of the ear ; the borrowed part of the contents is from the *Bhâratam.*

b. MANUSCRIPT BOOKS.

Manuscript book, No. 36—Countermark 286.

The *Vishnu-Upa-puranam.*

This is a version in Telugu of the above *Upa-purana.* There are eight books or sections ; of which the sixth is incomplete. The most remarkable portion is the 5th and 6th books, containing the *Surya,* and *Chandra vamsas.* The opening part is stated as if received from *Pulast'hya,* one of the seven great *rishis.* It relates to primal matters ; being little more than a repetition, or summary, of subjects contained in other *Puránas.* The different *Manuvantaras* ; the seven *dwipas* ; the measures of time ; the incarnations of *Vishnu* ; and connected topics ; are adverted to. The seventh, and eighth books, or sections, relate to the birth, adventures, and public acts, of *Crishna.* In this part, and indeed throughout the whole, there is a great apparent resemblance to the contents of the *Bhágavata puranam.* In the early portion especially, there is, I am persuaded, much enigmatical, or symbolical, writing and when such a veil is studiously employed, as seems to be the case in all early *Hindu* writings, it may be inferred, that the earliest colonists of India wished to conceal their true descent, or to falsify something concerning themselves ; as all the researches which have been made, or are now being carried forward, seem to render abundantly probable.

Note.—The writing of this book is very legible ; and the paper but very little damaged. Its restoration by consequence does not seem to be urgent. As to translation such might be best made from a copy of the

original Sanscrit work. Should however no such translation be likely to appear, then it might be desirable to give the contents of this manuscript, an English rendering, after matters more strictly relating to the peninsula-history have been attended to, and dismissed.

Manuscript book, Nos. 37 and 38.

It is necessary to class these two books together, as their subject is the same; that is local accounts of villages in the Northern Circars; with a special reference to the settlement of the *Niyogi*, or secular, *Brahmans*, as village accountants. They relate to the cleaning of waste, or forest lands, location of colonists, and the consequent building of villages, with fanes, and *mantapas*, the excavation of water reservoirs, and other details.

Both books are so greatly damaged from the effects of damp, or of salt water, and of the attacks of termites, as to be *irrecoverable*. It seems probable, that the restoration, were it practicable, would not be a matter of much consequence; but whether so, or not, the sense is so prevailingly lost, that nothing now can be done with the books, in the way of remedy.

From looking over the whole of the sections, wherever any sense can be made out, the following seem to be the general indications; as far as historical matters are concerned.

There are references to *Visvambara-deva* a *Gajapati* prince. The *Ganapati* prince is described as his offspring, and the date of Sal. Sac. 1056 (A. D. 1134), is given, as that of his installation. He made gifts of waste lands to *Gopa-raju* and *Ramana*, descendants from the *Aruvela-niyogi*-race, or secular *Brahmans*. These again subdivided the country into smaller districts among other *Niyogi-Brahmans*; and the country in this way, became peopled, and civilized. The preceding state of government gave way to that of the *Reddiváru*, which was superseded by the *Carnataca* rule. This was followed by the ascendancy of *Crishna rayalu*. His power yielded to that of the Mahomedans; and these were superseded by the Honorable Company.

Note.—These two books are entered in the Des. Catal. vol. 2, p. 18 and 19, art. xxxvii. and xxxviii., with a copy of the table of contents, prefixed in English to each of the books, which from what remains of those indices can be ascertained to be the same. As the books are irrecoverably damaged, a reference to the Catalogue may now suffice; without copying those indices in this place.

Manuscript book, No. 18.—Countermark 911.

Report of the progress of *Ni'ala Narrayan* through the *Malayalam* and *Conga* countries from 1807 to 1813.

The book is endorsed as among *Malayalam* papers; but these reports, in a series of papers, are in the Telugu language and character. The book is in a state of indifferent preservation; but does not require further notice.

Manuscript book, No. 19.—Countermark 912.

A continuance of reports from the same person in the Telugu language and character from 1816 to 1821. It is damaged by insects.

Manuscript book, No. 50.—Countermark 740.

Report of progress of *Narrayan rao* through the *Vencata giri* district, for 1814.

This book is endorsed as among Telugu papers. The first half of the contents are in Telugu; the latter half in Mahratta. The subject a journal of operations like the foregoing. It is slightly injured by insects.

Manuscript book, No. 51.—Countermark 741.

Report of progress of *Narrayan rao* in the *Vencata giri* district from April 1814 to May 1815.

A continuance of the journal from the last mentioned document, wholly written in the Telugu language; and in tolerably good preservation.

Note.—Journals of this kind do not seem to me to be of permanent interest, or importance. Hence I dismiss them with the simple mention.

Manuscript book, No. 4.—Countermark 694.

This book according to the English heading of contents (partly destroyed) once contained copy of an ancient record of *Kondavir*, and

its rulers, with a notice of the village accountants, and limits of certain districts in the Telugu country.

The book however is now so seriously injured, that it may be said if not to be destroyed by insects, yet to be so damaged as to leave no legible meaning. As such the book is of necessity passed by as *irrecoverable.* There is I think an account of *Kondavir*, in another paper belonging to the collection.

The book is entered in Des. Catal. vol. ii. p. 3, art. iv. simply copying the English table of contents.

Manuscript book, No. 9.—Countermark 699.

This book, like the last one is *irrecoverable;* being, if possible, in a worse condition. The first section referring to the *Comti*, or *Banian*, class of people at *Pennaconda*, might have been prevailingly recovered, had there not been two leaves at the beginning wanting, rendering the remainder destitute of value. The second section is most to be regretted as, according to the Des. Catalogue, it contained accounts* of the *Konda vandlu*, *Koya vandlu*, and another wild tribe, residing on the mountains, and in the woods, of the *Rajahmahendri* district. The remaining four sections would have been of less consequence. From the book itself, quite irrecoverable, nothing can be made out. All that can be done is to refer to the Des. Catalogue, vol. 2, p. 5, art. ix.

Manuscript book, No. 25.—Countermark 281.

This book contains the remnant of two sections.

1. "*Sesha-dherma-ratna-carum*, or rules supplementary to the *Mahabharata.*"

This title, in the English table of contents prefixed, is erroneous.

2. *Rangha rao charitra*, or account of a sanguinary battle between *Rangha rao*, a zemindar of the *Velmavar* family of *Bobili* in the *Calinga Circar*, with the chief of *Pusa-pati* named *Vijaya-rama raz*, and Monsr. Bussy, a French general under *Nizam ali Khan* of Hyderabad.

* Perhaps the loss is remedied by similar notices in a following book.

The former section is entered as a paper MS. in Des. Catal. vol. 1, p. 270, art. xii under the same title with the *Sesha D'herma* (before noticed) but is described as an introductory fragment, giving only the genealogy of *Timma raja*, zemindar of *Peddapur*. From an examination of the remains it appears to be a eulogy of *Vencata Crishna Raja* composed by *Timma raz.* A genealogy is connected with the panegyric. *Vencata* is merely an epithet, and it seems to me that the poem relates to the famous *Crishna Rayer.* Indeed I can have no doubt of it, inasmuch, as *Timma raz* was one of the eight celebrated poets of *Crishna Rayer's* court.

The other section is entered in the Des. Catal. vol. 1, p. 315, art. xxi, with some brief indication of its contents, and a reference to Orme's History, vol. 2, part 1, p. 254.

The contents of the book are now *irrecoverable :* they were written on thin country paper, in which large lacunes, in various parts of each page, are completely eaten through by termites, or other insects, and the leaves are in some places so glued together, in the manner common with these insects, that they cannot be separated without tearing: the loss is apparently not of grave consequence. From an examination of the 2d section it appears that the notice in the Des. Catalogue is sufficiently accurate. There is I understand a very long poem on the subject.

Manuscript book, No. 67.—Countermark 864.

This book contains three reports, or journals, of *Ráma dasa*, in his journeys through the Ceded Districts, in search of the antique and curious, from June to December 1809, from January to September 1810, and from October 1810, to May 1812. The paper is only a little injured; the ink good; and, as it is, the book will last many years, with only common care.

I do not make such journals the subject of abstract, or special observation.

Manuscript book, No. 10.—Countermark 700.

Section 1. Account of *Vira Crishna deva* the *Gajapati* prince of *Bárābatti*, or *Cattacapúri*, in the *Udiya* country.

In early times *Vira Narasimha Gajapati* ruled in the above mentioned town; conquered the king of *Calinga-desam;* and subdued other countries. He built, and had set apart, a fane to *Varaha Narasimha svami. Vira Capilésvara Gajapati* built an *agrahâram* and a fane, on the banks of the Godavery river. *Purushóttama Gajapati* built a village, and an *agrahâram* on the sea shore, bearing his own name: he also built and had set apart, the fane of *Jaganát'ha.* His son was *Pratapa-rudra Gajapati.* His rule to the westward, especially over certain fortresses and villages, was rather more extensive than that of his predecessors. While so ruling *Vira Crishna Raya maha rayalu,* coming from the west, drove away the said *Pratapa-rudra;* and, after remaining some time, returned. The fugitive prince took refuge in the town, or village, called *Andhramanêmam.* After some lapse of time, *Vira Crishna-deva* of the *Gajapati* race ruled. He gave his eldest daughter in marriage to *Bâhu Balendra Vira Mukunda-raju;* and his youngest daughter to *Basava raju* son of *Mádhaverma,* of the *Pusapatti* race, of the town of *Bezavádà.* These two sons-in-law he kept in his own palace. The latter being the most handsome of the two, the marriage on the part of the king's youngest daughter, was one, on her part at least, of affection; and, by her means, the young man became a favourite with her father. The king at all times wore a sword, on the possession of which his kingdom, and authority, were considered to depend. The young man *Basava,* abusing the confidence reposed on him, contrived by stealth, and in a way which the manuscript styles mean and unworthy, to get possession of the sword, expecting the kingdom to follow. A great disturbance arose; but the king at length regained the valuable heir-loom of his race. He then sent away the said son-in-law to his own town; together with wife and dower. He caused an illegitimate son to be installed as his heir to the kingdom; to the prejudice of three legitimate sons. Disgusted at this preference, the eldest of the two legitimate sons went away to *Jaya-puram,* and established a rule over nine *pálliyams,* or districts. The second son established a rule over nine districts in the *Kimedi*-country. *Bhimadeva,* the third legitimate son, laid the foundation of *Vijayanagarum* (that is what is commonly written *Vizianagarum* in the Northern Circars, not Bijnagur on the Toomboodra river). He there established a rule over twelve *pâlliyams,* or districts. After the death of the aforesaid *Vira Crishna deva Gajapati,* the husband of his youngest daughter; that is to say *Basava raja,* killed *Balendra,* the husband of the eldest daughter; and took possession of the district which had been given to the said *Balendra* as a marriage portion. At this time the *Mléchch'has* (barbarian foreigners) took possession of the aforesaid town of *Cattacapuri* (Cuttack).

The before mentioned *Bhimadeva-Gajapati* leaving no offspring, six of his *Palliyams* were united with the *Kimedi*-country, pertaining to his elder brother. The remaining six districts were united with the *Jaya-pur* sovereignty of the eldest brother. *Sita-Rama-Chandralu*, of the posterity of the before mentioned *Basava*, conquered the two countries of *Jaya-pur* and *Kimedi* ; and also levied tribute from them, in acknowledgment of his sovereignty. This *Sita-Rama-Chandralu* had no offspring : he adopted one of his own *Pusapatti*-race, who was named *Vencatapati-raju*, who succeeded him on his death. His manager, or minister, named *Bandi-Jaga-rao*, took possession of the kingdom, and put the said young man, *Vencatapati* in prison. While himself ruling in his usurped authority the younger brother of the one imprisoned, who was named *Ananta-raju*, and was in the service of the Golconda Nabob, with troops of the latter overthrew, and killed, *Nilacont'ha-raju*, the general of *Jaga rao*, and also *Jaga rao* himself. He then re-instated *Vencatapati* as king, and became his second in authority. They relinquished *Portnur ;* and built another *Vijayanagaram*, forming a fort, and residing therein. This *Vencatapati* had a son named *Sita-Rama-raju* ; and *Ananta-raju* had a son named *Vijaya-Rama-raju*. These two children disagreed ; and ruled separately, until *Sita-rama-raju* died. His son *Ananta-raju* was brought up by *Vijaya-rama-raju* who conquered *Timma-raju* of *Peddapuram*, putting his son in the father's place, he also killed *Nagaji Hussein Khan*. He also took tribute from Cuttack and other places. The Mahomedan ruler of Golconda thenceforward acquired an ascendancy ; and established different rulers, by his firman, or edict. The name and influence of Monsr. Bussy the French general is subsequently introduced. Hyder Jung was his agent in the management of French affairs, in the Northern Circars. The ruler of *Bebulli Cotta*, whose ancestors from the time of *Ananta-raju* had been adversaries, and had introduced the Mahomedan ascendancy, was now oppressed in return. Soon after the country was conquered, from the Bengal side, and became subject to the Honorable Company. The rule of chieftains, under them, continued down to *Narrayana Gajapati*, who ruled at the time when the manuscript was written.

Section 2. Account of the *Cóndu vandlu*, a wild tribe residing in the *Jayapur* district of the Northern Circars.

A distinction is to be noted between the *Cóndu Cóthu* (or *Kondoo*), *vándlu* and the *Conda* (*Konda*)-*vándlu ;* the former class of people form the subject of this section; the *Conda-vándlu* of the next one.

The *Cóndu-vándlu*, dwell in hills and passes of hills; in rude huts, like cow-sheds. They are very careful of water-springs. They beat, and plunder, solitary travellers: some use brass vessels: some dry gourds; some earthen vessels. In every house two or three dogs are reared. Their chief has the title of *Nayak;* inferior chiefs are termed *doralu.* The villages pay from six to thirty rupees, as tax. The *Nayak,* on receiving the tax, points out, and assigns lands to different individuals. They cultivate *Cholam* (Holc. Sac.) and other dry-land grains; as also rice in the wet lands: the poorer sort, sell a portion of their grain, to pay their tax, and live on the rest, as also on the proceeds from tamarinds produced on their lands. Both sexes labour in the cultivation of grain. They labour in their fields, from day break till noon; when, from their position, it is very cold. At noon the power of the sun produces great heat, and thirst, which induces them to cease from work: they make large use of butter-milk, and other beverage, the effect of which, according to the manuscript, is to make them pot-bellied, with small legs and arms, and causing unhealthy aspects. In the hot season they sleep wherever they please. In the rainy season they sleep on couches within doors, having stoves, or similar things, inside to warm their dwellings. They place a watchman at night on a stage in the fields, to protect the corn from beasts. The *Paindu-vándlu,* a class of *pariars,* weave their garments; which, as worn by the men, are a cubit and three quarters in breadth, and sixteen or seventeen cubits in length. The women's cloth is not quite so long. As they are very uncleanly in their persons, so they emit an offensive smell. The men wear a crown-tuft of hair. They wear finger rings of brass, or other mixed metal; some have them of silver. Their language is distinct; and if they speak Telugu, it is with an imperfect utterance. Their marriages are fixed, as to time, by an astrologer whose influence extends over from forty to fifty villages. Some specification is given of their marriage-ceremonies; the eating of flesh, and drinking strong liquor, being a part. They have some other ceremonies, connected with the age of their female offspring. Their *pusari* is termed *Jani vándu;* the *numen* worshipped is called *Jacara,* a sylvan god. In order to promote the growth of grain in their fields, they give a portion of grain from a former crop to the *Jani,* who then performs a ceremony, by offering some leaves, and anointing the image of *Jacara.* The same thing is practised, through fear of tigers, for the sake of protection. The caste-thread is not worn by any among this people; with one exception, in the case of *Vencatapati raju* of *Pála-cónda-vira Gottàm;* who, exercising kingly power, puts on the thread, but without any attendant ceremony. The *Cóndu vandlu* are also termed *Játápa doralu;*

and it is immaterial whichsoever of the two names is used. They are one and the same people.

Section 3. Account of the *Conda-vandlu* people, in the *Jayapur* district.

They wear a tuft of hair on the top of the head, in the form of a ball; some wear mustachios, and some use the *Saiva*-burnt ashes, on their foreheads. They do not speak good Telugu. They dwell on hills; are of disagreeable appearance; cultivate grain in suitable places; pay taxes; watch the grain on platforms. Some wear a dagger in their girdles; carry muskets; tie a handkerchief on their heads; and do the work of peons, or soldiers. They receive pay in an allowance of grain, so much per diem. They dwell in sheds, like cow-sheds. They chiefly use earthen vessels; a few people only have vessels of brass. A specification of dress is given; and of some customs of the females. The chief with the title of *raja*, wears the *punnal*, or caste-thread. Other chiefs are called *Doralu*. Before marriage they go to some distance to consult a Telugu *Brahman*; and by his means fix on the *muhurtam*, or minute, proper for the ceremony. If there is no *Brahman* near at hand, as usually there is not in places in, or near, the woods, then they call an astrologer named *Succa-divi*, one of their own class. Fixing, by his aid, the proper time, they bring him to the ceremony; and he, partaking with them of flesh and ardent spirits, is afterwards dismissed. However they do not eat raw-flesh. If a husband dies, the widow may marry again. A few of the people are votaries of *Vishnu*; others of *Siva*. The women do not plough, nor use the large agricultural hoe; but they gather tamarinds, and sell them. Those persons who are employed as peons permit their wives also to engage in the same trade of gathering, and selling, tamarinds.

Section 4. Description of the boundaries of the *Jayapur* district.

It is not necessary minutely to follow in this place the details of the circumference, or boundary line, further than to mention that the district is in the proximate neighbourhood of Vizagapatam, Kimedi, and Ganjam. A variety of small chiefs, with little districts, were spread around; one being termed *Sanniyasi-raju*. On one quarter *Kirata* (or wild savage) people are mentioned; and also the *Savaralu*, a distinct people; one of whom is described as a common pest, and incendiary. The

section is not without use. It seems to me that the *Hindus* had but imperfectly penetrated the mountain-fastnesses; still possessed by aboriginal mountaineers.

Section 5. Account of the *Maliyasavarulu*, in the neighbourhood of the *Jayapur* district.

These are a people with small eyes, noses, ears, and very large faces, (Hun, Tartar, or Calmuc, class). Their hair is thickly matted together. They bind either a cord, or a narrow bit of cloth around their head, and in it stick the feather of a stork, or of a peacock, and also wild flowers, found in the forests. They go about in the high winds, and hot sun-shine, without inconvenience. They sleep on beds formed of mountain-stones. Their skin is as hard as the skin of the large guana-lizard (rough, indurated, not delicate). They build houses over mountain-torrents, previously throwing trees across the chasms; and these houses are in the midst of forests of fifty, or more miles, in extent. The reason of choosing such situations is stated to be, in order that they may the more readily escape by passing underneath their houses, and through the defile, in the event of any disagreement, and hostile attack, in reference to other rulers, or neighbours. They traffic with the grain, which they raise ; and purchase tobacco leaf, and various other trifles, in return. They cultivate independently, and pay tax or tribute to no one. Each one has a very small field ; and they are obliged to make up their subsistence by other means : among which catching hares is mentioned. If the zemindar of the neighbourhood trouble them for tribute, they go in a body to his house, by night ; set it on fire, plunder, and kill : and then retreat with their entire households into the wilds and fastnesses. They do in like manner with any of the zemindar's subordinates, if troublesome to them. If they are courted, and a compact made with them, they will then abstain from any wrong or disturbance. If the zemindar, unable to bear with them, raise troops, and proceed to destroy their houses, they escape underneath, by a private way as above mentioned. The invaders usually burn the houses, and retire. If the zemindar, forego his demands, and make an agreement with them, they rebuild their houses, in the same situations, and then render assistance to him.

In their marriage ceremonies they consult the *Succu-divi*, or astrologer, and these are similar, on the whole to those detailed with reference to the two former classes, in the two last sections. They seem to be only a variation of the same species.

Note.—This section, concerning this wild and indomitable people, to me seems a curiosity.

Section 6. Account of the *Conda Savaralu*, or people of the hills of the *Jayapur* district, in the province of *Rajamahendri.*

The women of this tribe get wood from the forest, which they afterwards sell, and exclusive of this small commerce, they also labour in the cultivation of grain in the fields. After child-birth the women are under regimen for three days only; and, on the fourth, they go out to work in the fields. There is no washerman-caste among them; hence the women wash the clothes of their households. In the hair lock, on the crown of the head, and other circumstances, they have peculiarities. They pay some small tribute; assist the chiefs in times of trouble; and dwell, not in thick forests, or mountain-fastnesses; but on the edge of the former, and near to the villages of the low country people, or *Hindus.* Hence they are a degree more civilized; and have acquired the distinctive name of *Conda Savaralu.* They hold however with the *Maliya savaralu* that kind of intercourse which consists in mutually giving to each other daughters in marriage; marking affinity of tribe. When they go to war they stick the feathers of a fighting cock, or of a stork, in their hair; and then wear garments hanging downwards to their knees. They wear a dirk or knife; carry bows and arrows; and use the horn of a kind of deer, for a trumpet. They fight only in bushes; but decline any combat in the open plain. They make night attacks; and they burn down houses. It is said that they do not regard the *wound* of a musket ball, as they have a remedy for it: they are afraid only of a cannon ball: for which, of course they have no remedy. They have no internal distinctions of tribes, or castes. Both men and women labour in the fields. The writer here says that since they have the *Janivandlu,* as hierophants, and are accustomed to eat flesh, and drink ardent spirits, at their sacrifices, they appear to *him* to be of the *Sacti*-class (an opprobrious sect among the *Hindus*). The *Janis* allow no one to approach, or to hear, while repeating their *mantras,* or formularies.

Note.—This I apprehend to be the class described by Mr. Stevenson's paper, translated by me, and printed in No. 16 of the Madras Journal of Literature and Science. Discussion and difference of opinion having arisen on the subject, I am happy to meet, in the Mackenzie papers, with documents to elucidate, and I think set the question at rest. The derivation of the word *Savaralu,* seems to be the Sanscrit word *Savara,* a barbarian or savage, with the addition of the Telugu plural *lu.*

Section 7. Account of the villages of *Chellur* and *Catéru* in the *Rajamahendri* province.

The origin of *Chellúr* is dated in the time of *Agastya*, who is said to have planted a garden, and formed a tank, with a *Saiva* fane, and a *Vaishnava* fane; at first called *Chendlúr*, and in the *Cali-Yuga* shortened to *Chellùr*. After the rule of the kings of *Ayodhya* was finished, one named *Vijaya âditya* ruled 48 years, and had a son named *Vishnu-Verddhana*. From him is deduced a line of *Chalukiya* chiefs of the *Rajamahendri* circar or province; which, if it can be depended upon, is of great value, and consequence, in an historical point of view, as to this particular.

The *Chola* conquest by *Kulottunga Cholan* is recognized. Afterwards the *Vemana* family ruled. The *Reddivaru*, and other chiefs, are specified.

The subject does not admit of abstract: but merits full translation, as a document affording historical matter, to be then judged of, by comparison with others, as to value and authority.

General Remark. As regards the condition of this book it may be observed, that it was originally written in a fine intelligible hand, with good ink, but unhappily on thin country paper, which is greatly injured by insects. Had the hand-writing been smaller, the whole would have been irrecoverable; as the case is a restoration has been effected with tolerable success; yet not without omissions of words, in some places. That the sense is preserved may appear from the abstract given.

The paper on the *Chalukiya* kings of *Rajamahendri* is valuable; but will require to be compared with section 4 of MS. No. 12, next following. The valuable labours of Walter Elliott, Esq. in fixing, from inscriptions, the dates of some of the *Chalukiyas*, will, aided by these two papers, and other details to come, render historical deductions concerning the *Rajamahendri* principality comparatively easy, and to some degree certain.

Manuscript book, No. 12.—Countermark 702.

Section 1. Account of *Sitandam*, in the district of *Rajamahendri*.

Reference to *Rama Chandra*, who lived in privacy in the country near the Godavery-river, and had his wife *Sita* abducted thence by

Ràvana. In consequence of a particular symbol having been formed of mud in this place, it acquired the name of *Sitandam*, from *Sita.* A fane of *Rama-svami* was, at a later period, constructed. In the time of the *Chalukiyas*, they had the festivals therein regularly managed. In the time of the *Chola kings*, and in Sal. Sac. 1024, these having conquered the *Andhra* and *Calinga* kingdoms, had servants, female slaves, &c. added to the fane. Under *Pratapa-Rudra* of *Orankal* (or Warankal) all matters were carried on, in the said fane, as before. The periods of reign of three *Reddis* are specified, as follows: The *reddis* of *Condavir Polaiya-vema reddi* 12 years, *Annapota vema reddi* 30 years, *Dherma vema-reddi* 12 years. The statement follows of a *Brahman* from Golconda, on whom a daughter of a forester of the *Billa-jana* (Bheels?) fixed her affections; and, by consent of her parents, was married to him. After two or three years residence the *Brahman* asked her to shew him any thing special in the forests. She took him to a particular place and shewed him what is termed *rasam*, or the agent in alchymical operations. He, knowing its quality, afterwards went secretly, and concealed a quantity of it in the hollow of a bamboo-cane, which he deposited in the house of a *Chetti*, or petty trader. The latter, discovering its value, stole it, and absconded: setting fire to his house in order to cover his proceeding, with a plausible pretext. The *Brahman* came to ask for his property, all knowledge of which was denied, and the *Brahman* going into the house to seek for it, perished in the flames. The trader soon after died. Of his race an old woman remained. *Dherma vema Reddi* obtained from the said matron the contents of the bamboo; and by means of it procured great wealth; but in return was troubled by the spirits of the aforesaid *Brahman*, and trader, as evil demons. Unable to bear the annoyance he, at the instance of those demons, built a fane; together with all the usual adjuncts. He also affixed their names to his own son. *Comti-Raja-vema reddi* ruled 27 years. *Raja-vema reddi* 4 years. *Cumara-giri reddi* 14 years. After a few changes, the Mahomedans from Golconda, under Ibrahim Padshah, came and conquered the country, in Sal. Sac. 1495. A few other particulars are given; relating solely to repairs, or additions to the village fane.

Section 2. Account of the village of *Boyana-pudi* in the *Rajamahendri* district.

In the opening of the *Cali Yuga*, *Mukundi isvara* ruled in *Darani-cota.* When bathing in the *Godaveri* he had a vision of *Bhima-isvara*, and

another local *numen ;* and soon after discovered a symbolic image, in the midst of a wood, over which he had a small fane built. He maintained one *Siddha muni* a *Jaina Brahman*, who assembled several of his class and constructed a *Jaina* fane, with images inside. The king was a great patron of the said *Brahman.* A dispute took place between himself, and his wife, as to the respective merits of the *Jaina Brahman*, and the Telugu (i. e. *Saiva*) *Brahman.* In order to test their skill, the chief put a large snake in a pot, and secretly hid it under ground: he then called on the two *Brahmans* to tell him what he had done; stating that whichsoever failed to declare it, should be put to death in an oil-mill. The *Jaina Brahman* told the king he had put a snake in a new pot, and buried it. The Telugu *Brahman* said the king had hidden a valuable necklace in a pot. On digging the vessel out of the ground, the Telugu *Brahman* was found to be right. In consequence the chief punished all the *Jaina Brahmans.* His son was *Rama Bhim-esvara*, who placed one of the *Boyana* class, otherwise called *Nilam vandlu*, in charge of this village and fane; which thence acquired the name of *Boyani pùdi.* He assembled many of his tribe. Things proceeded, without interruption, down to the time of *Kulottunga Chola.* The *Gajapati* rule followed, in amity with the Mahomedans; but, enmity arising between them, one of the parties went to Golconda, and brought troops thence, which took this village. During Mahomedan rule, the privileges of the fane, and of the *Nilam* people, were taken away; but the latter, unwilling to relinquish their birth-place, took to cultivation. The *Niyoji Brahmans*, at a subsequent period obtained exclusive privileges.

Section 3. Account of the forest of *Chinna puvu tena*, in the *Rajamahendri* district.

Reference to an extensive forest of twenty Indian miles (about 25 English) in extent. Not far off is the sea. There are vacant spots in the said forest, where cattle were fed. Various particulars are added as to the production of the forest; especially a particular kind of honey, produced by bees feeding on the *Chinna puvu*, a kind of flower. This district is under the zemindar of *Pit'ha-pur.*

Section 4. Account of the *Amildars* (or rulers) of the *Rajamahendri* Circar (the *Chalukiyas* and others).

Anciently the *Chalukiyas* ruled; of whom *Cubja-Vishnu-Verddhana* is first specified. Thenceforward is deduced, in brief, the following:

List of Chalukya, and other Kings.

Vijaya aditya, 48 years.

Vishnu Verddhana, 12 years.

Vijaya aditya Chalukya, 44 years, founder of *Rajamahendri* fort, &c.

Bhima, son of Vicramaditya and nephew of Vijaya aditya.

Amma-raja, 7 years.

Vicramadityan, son of Bhima, 11 months.

Chalukya raja, 7 years.

Bhima maha raja, 18 years.

Amma raja, a short time.

Dhana Bhupati, 3 years: in his time the Chola king came and captured the *Vengi desam*, and ruled 27 years. Afterwards of the Chalukya race—

Kirti verma raja, 12 years, re-conquered *Vengi desam.*

Vimaladitya, 7 years.

Raja Narendra, 40 years, Sarangadhara was his son, concerning whom the Sarangadhara Cadha was written.

Rajendra Chola, 15 years.

Vicrama Chola, 5 years.

Kulottunga Chola (no time stated), name of dynasty.

Pritisvara maha raja, 35 years.

Mallapa devá, of the Chalukya race 10 years (SS. 1124).

Annaiya deva, of the Surya race, 30 years.

Annaiya deva bhupalan, 30 years.

The Reddi-race followed.

Potaiya vema reddi,

Anupota vema reddi,

Dherma vema reddi,

Comti vema reddi,

Raja vema reddi.

These ruled during 100 years; the country then came under the *Gajapati* ruler, in the time of *Vira Narasinha Langula.*

Pratapa Rudra.

Mukunta deva.

Raja vidyádhara.

Notice is then given of an extensive grant, by way of privilege, made by the *Gajapati* prince to a *Niyogi Brahman,* leading to an extensive diffusion of that tribe in the *Rajamahendri* district. A few minute details bring the account down to the Mahomedan conquest of Warankal.

Remark. This list is not so full as that in section 7, of M. S. book No. 10 foregoing. Both lists require to be translated, and compared.

According to the index of contents prefixed to the book, there should be a fifth section, containing an account of *Vamagiri,* a hill fort in *Rajamahendri* Circar, but this paper is not now contained therein. The

name of *Yoma giri* appears in section 4, as that of a capital or fortress of the *Chalukyas*; but the whole account is contained in one paper.

General Observation.—This book was so much injured by insects, that I doubted the practicability of its satisfactory restoration. The patient labour of a copyist has however been tolerably successful. In a few places, of necessity, words are lost. The contents are of value; chiefly so the 4th section. The 3d section is of the least consequence.

Manuscript book, No. 41—Countermark 731.

Twenty five tales of the *Vetala*, related to *Vicramaditya*.

This is a version of these popular tales, stated to have been obtained in the Telinga country. It is superfluous to make any abstract, because sufficient notices, or full translations, of them have been already published. This book is damaged at the edges, by damp and termites; but the writing within is only very slightly touched, and the ink is good. It will last for some years; though its preservation is not of consequence. The book is entered in Des. Catal. vol. 2, p. xxiii.

MS. Book	No. 14,	C. M. 704,	Des. Catal. vol. 2, p. vii	art. 14.
Ibid............	,, 16........	,, 705	Ib. vol. 2, p. vii,	art. 16.
Ibid............	,, 17........	,, 707............		art. 17.
Ibid............	,, 18........	,, 708............		,, 18.
Ibid............	,, 20........	,, 710............	p. ix,	art. 20.
Ibid............	,, 23........	,, 713............	p. x,	art. 23.
Ibid............	,, 24........	,, 714............		art. 24.
Ibid............	,, 25........	,, 715............		art. 25.

These books are thus briefly classed together, because their contents are similar, and of trivial or no importance; being merely minute lists of accounts, or revenue proceeds from various *caranams*, or local subdivisions, of various districts in *Telingana*. The reference to the Des. Catal. will afford the respective indices of contents, prefixed in English to the several books; only in making any such reference care must be taken to observe, that the English having been written by a native, the phrase "particular account" must not be misunderstood to mean any connected statistical narrative; but merely detached lists of places, and revenue, as an accountant would make entries in a ledger, or similar book. Any attempted abstract would be impossi-

ble; if possible, useless. In general the paper and ink are in sufficiently good preservation.

Manuscript book, No. 33.—Countermark 723. Des. Catal. vol. 2, p. 16, art. xxx.

Account of allowances to the fane of *Calahastri isvara* in Telingana.

This, like the preceding, is merely a list of numerical accounts, differing only in subject; which, in this instance, relates to allowances made from revenue proceeds to the *Saiva* fane at *Calahastri*; a place of considerable repute about 40 miles N. of Madras. The paper is in tolerable preservation, the ink good: the document will last several years.

Manuscript book, No 52.—Countermark 742.

It contains a journal of *Mallaiya*, from January to December 1814, in his journey through the Ganjam district; is written in Telugu; and is in tolerably good order, though touched here and there by insects.

Manuscript book, No 53.—Countermark 743.

A continuance of the same person's journal, in the same neighbourhood, for the year 1815. It is a little more injured by insects, than the foregoing; but perfectly legible throughout. Neither of these two books require any further observation.

C. MAHRATTI.

Manuscript book, No. 61.—Countermark 858.

Ancient record of *Nandivaram*, containing an account of *Nandan Chacraverti*, and of the thirteen tribes of *Nandivani Brahmans*.

To the north of the *Vindhya* mountains is the *Ariya bhumi*, or sacred land: in it are the Ganges, the Jumna, and other rivers; it was the residence of *Brahma*. The *Brahmans* came from his face. To the

south of the *Vindhya* mountains is the *Dandacáranya,* in which *rácshasas* and others, resided. As the *Dandacáranya* was vicious *(páva bhúmi* opposed to *punya-bhúmi* before specified), so it was very lofty, or elevated. The *Vindhya-asura,* by severe penance, had acquired great power, so as to trouble gods and men; and the *Brahmans* complained of the interruption of their daily sacrificial ceremonies, to *Agastya,* who carried their complaints to the presence of *Brahma;* further representing that since there were no *Brahmans* in the *Dandacáranya* it would be expedient to create more of them, and locate them in that land. In consequence of this request, *Brahma* created the following classes of *Brahmans.* 1 *Andhra,* 2 *Mahrashtra,* 3 *Drávida,* 4 *Carnata,* 5 *Gujra;* these forming the *pancha Dravida* (or southern class) were directed to go with *Agastya,* and remain in the strange land; while the 1 *Mânava,* 2 *Cúbjaya,* 3 *Canójya,* 4 *Ragada,* 5 *Gauda* forming the *pancha Gauda* (or northern class) were to go with *Agastya,* but to return. *Agastya,* accompanied by the *Brahmans,* proceeded to the *Vindhya* mountain, where the *Vindhya asura,* with his disciples came to pay him respects. *Agastya* told him that he himself was going to the south on pilgrimage; and directed him (the *asura*) to stay in this place, with his people. *Agastya* then, holding his water vessel in one hand, struck the mountain with his pilgrim's staff held in the other hand, and by doing so levelled it. He then directed the northern class of *Brahmans* to return; and, taking the southern class with him, he proceeded to the south. From that time the *Dandacaranya* ceased to be the abode of *Racshasas.* The five divisions of the southern class of *Brahmans* gradually filled the southern countries, and many towns were built therein; while the northern class of *Brahmans* retained their possessions in the north.

* * * * *

(In this place three leaves are cut out from the book).

In Cali yuga 2604 *Nandana Chacraverti* reigned over a vast extent of country, in a town called *Nabavar.* One day a religious person from the company of *Agastya,* came to that town; and, in consequence of civilities received from the king, taught him a *mantra* (or charm) by the use of which he possessed the power of proceeding whithersoever he wished in a short space of time. Possessed of this power he daily visited *Gaya* (the celebrated place of pilgrimage); and his wife, after some time, also accompanied him. Receiving some civilities from a *Brahman,* at a place where they halted by the way, he made the *Brahman* a magnificent present, and encouraged him to expect more, should the said *Brahman* visit the king's territory. The *Brahman,* encouraged by the promise, engaged five hundred other householder-

Brahmans to accompany him; and, with them, proceeded to the presence of the monarch, claiming a performance of the promise; which the king was disposed to refuse; but on the *Brahman* bringing the *svami* (*Siva*) and *Devi* (*Parvati*) as witnesses, the king joyfully fulfilled his engagement, by giving a large town, in free tenure, to the *Brahman* and his associates. As the *Brahman* considered the favour of *Devi* to be the cause of this splendid acquisition, he built a fane, with the usual accompaniments to her honour, and, for her worship. While the *Vedas*, and other books, were being read in that *agraharam*, as usual, a young *Brahmachari* went from it, and asked from "the *Rayalu*" a marriage-present. The king told those around him to examine, and report, on the circumstance; and these, stating that the residents in that *agraharam* were all stupid people, recommended a public examination of the young man's learning. In consequence he performed penance to *Devi*, who satisfied therewith, directed him to go to the examination without fear. He did so; and having passed it, received from the monarch the present which he had sought.

(Here the book ends; apparently without a proper close. It is in tolerable good order; and does not call for immediate restoration).

Remark. By means of this book I have been enabled to understand the *pauranical* fable of *Agastya* having "humbled the pride of the *Vindhya* mountain." It is nothing more, nor less, than a symbolical statement of the first immigration of the *Dravida Brahmans* into the Peninsula, from the north; where they had earlier obtained a footing. Once understood the symbol is easy and natural. It is a subject of frequent allusion, in various *Hindu* compositions. Originally the *Brahmans* were most certainly foreigners to the Peninsula. To know that, is one important step in tracing their remoter origin.

The cutting out of three leaves, containing an account of "the obscure *Nandi-varam* dynasty" is a fault attaching somewhere; and it greatly deducts from the value of this manuscript.

Manuscript book, No. 20.—Countermark 932.

Section 1. Account (or local legend) of the fane of *Sri-kétha tanda* at *Pandarpur.*

Reference to the fault committed by *Chandra* (according to the *Puranas*); in consequence of which his preceptor denounced on him a punishment of loss; and upon *Chandra*, enquiring when the fault would be

expiated, his preceptor gave him a staff (*Kêthatanda*) with directions to dip it in the *tirt'has*, or sacred pools, which he might visit in his pilgrimage; and in whichsoever it should remain, so as not to be capable of being drawn out again, in that pool, by means of bathing, the fault would be removed. According to these instructions, *Chandra* acted; and on dipping his staff in the pool at *Yálimarjuna*, in the *Dandacaranya*, it remained immoveable; and he was released from his spell-bound situation. The writer of the legend refused to call the pool the *Chandra tirt'ha*, but named it *Kéthatanda tirt'ha*; and sung its praises in the twelfth *adhyaya* or section, of the local *purana*. At that time there was a small village near the spot: in which a *Brahman* named *Pundarica* had built a small hut of dry-grass and reeds; and lived therein, with his relatives and family. As many people passed by, going on pilgrimage to the Ganges, he became affected with a desire to do so too; and proceeded from home, for that purpose. He came as far as a place called *Chittra cúdam*, where he lodged in the house of a *Brahman;* and asking him how far it was to the Ganges, the latter replied he did not know. In the morning the Ganges, Jumna, and *Sarasvati*, in the shape of three females, came and performed all needful household work for the *Brahman* host; and, learning from the pilgrim his purpose, told him that they came hither every day. (A mere allegory to imply the use of water in household affairs). The pilgrim-*Brahman* now judged it his best course to return home, and provide for his aged father and mother. On returning, he found them fainting for want of nourishment; but they revived on his return. While engaged in supporting them, *Nareda*, unknown and unobserved by the *Brahman*, came and saw his filial piety, which he reported to *Crishna*, then residing in *Dwaraca-puram*, who was so much struck with it, that he went himself to see it. Soon after he had witnessed the *Brahman's* filial care, the parents of the latter died; and then *Crishna* identified the body of the *Brahman* with himself (i. e. the *Brahman* died). In consequence of *Crishna's* absence his wife *Rukmeni* sought him in many places; and at length found him at this one. Fanes, shrines, &c. connected with them having been built, *Crishna* then took leave of absence; saying he was going away to perform the *Varáhavataram*, and in consequence of his leaving the place for that purpose, it became termed both *Panri-nat'ha*, and *Pundiri nat'ha* (the latter apparently indicating the *Brahman's* name, and *Panri* meaning, in the common dialects of India, "*a pig*;" *Panri-nat'ha*, being equivalent to *Varaha-svami*).

A Nizam made great benefactions to the fane; and, at a later period when the country had come under Mahomedan rule, the revenues of the fane were assumed by them, and required to be paid into their

treasury. One of the guardians of the fane, having neglected to do so, was followed by the Mahomedans, seized in the fane, and imprisoned. The god offended at this ill treatment of his votary, withheld rain for twenty-four years from the country of the Moghuls: in consequence of which visitation they gave a jaghire for the purpose of providing the customary articles for its service; and then the god sent rain in abundance. *Sivaji*, and other Mahratta rulers, made large donations in land for the benefit of the fane, which thus became very prosperous.

These particulars concerning *Pundri-púr* were written, to the best of their knowledge and information, by *Malla-hara Bhatt*, and *Lacshmana Bhatt*, at the desire of Colonel Mackenzie, in May 1807.

Remark. This paper is curious, chiefly in a mythological point of view; but it indicates a low standard of intellectual attainment. The indirect contempt of pilgrimage to the Ganges, and the preference given to domestic piety, are however observable. The anachronism and contradiction of making *Crishna*, the so-termed eighth *avatara* of *Vishnu*, go away in order to become the fourth, as *Varaha svami* or *Panri-nat'ha*, is of a different and much inferior kind.

Note.—The document is written on stout Europe paper, in unfading ink: and being also untouched by insects its restoration is not required.

Section 2. Statistical account of *Ahmednagar*.

Commodities imported and exported, periods of cultivation, and of rain—times of harvest—productions of the soil: these are minutely specified, as far as the document proceeds.

Remark. The English heading of the section also promises an account of beasts and birds; but the document in the book is not complete; and how many leaves, at the end, are wanting cannot be ascertained. It is written on very thin country paper, with indelible ink; but has been severely injured by insects. As however the subject matter is not of importance; and as the document is not complete; its restoration has not been thought needful.

Section 3. Account of *Comaradee-Shah* inhabitant of *Wastarra* 1805.

Such is the heading of the paper itself, which by the native writer of the table of contents, has been made—"Account of Camaraully Sahan of Hindoostan."

The real contents of the paper are a genealogical notice of the Ajmeer ruler, with his pedigree, from an early period.

Note.—One part of the document is complete : another one follows, on the same subject, having three leaves at the beginning but wanting the remainder. The former document, written on inferior country paper, and much damaged by insects, I have had re-copied ; since its details, such as they are, assume the shape of local history : the other fragment does not claim the same attention.

Section 4. Account of *Gujirat,* and its *rajas.*

This paper was restored in the 3d volume, and abstracted, in my third Report ; which may be consulted.

Section 5. Account of *Vicrama-raja* of *Uchchani,* or Ougein.

A mythological tale. *Parvati* is represented as enquiring from *Siva* an account of the manner in which *Vicrama* acquired the throne of *Indra. Siva* states that an inhabitant of *Indra's* world having offended his chief was sentenced to come to earth, in asinine form (symbolical) in which form the *Gandharva* married the daughter of the king of Ougein, and became father of *Vicrama,* and his brother *Batti.* It narrates the visit of *Vicrama* to *Indra* to adjust a dispute there ; for the doing of which he received from *Indra* a jewelled throne, which he brought down to earth (symbolical). After the death of *Vicrama* his conqueror *Salivahana,* attempted to ascend his throne ; but was prevented by the statues which supported the throne acquiring the power of speech, and narrating actions of *Vicrama,* which shamed his successor, and prevented him from taking his seat there.

Remark. This is a Mahratta version of the popular tale found, under variations, in all the vernacular languages of India. The acquisition of *Indra's* throne is a mere allegory to imply the possession of great prosperity. The paternal origin of *Vicrama* is variously told : in this tale it is put into as degrading a form as possible ; but still under an enigma. In other versions of the tale, *Bhoja-raja* is represented as succeeding *Vicrama,* and shamed out of the idea of sitting on that prince's throne. Here the name given is that of *Salivahana* ; concerning whom other versions of the tale offer very confused accounts. The probability is that *Salivahana* and *Bhoja-raja,* are only different names of the same

individual: this conjecture was originated by documents heretofore examined, and reported on, and may yet be confirmed to certainty. Both (if distinct persons) were of another religious system, with reference to Hinduism proper: probably of the *Jaina* persuasion; and hence much of the mystification of *Hindu* writings concerning them. The not sitting on *Vicrama's* throne is an allegory to designate building and ruling in another town than Ougein; which fact, together with a coincident change of dynasty, has been historically ascertained in the course of the preceding researches.

Note.—This document is damaged by insects; and the series of tales is not complete. Being so very common and popular a tale, many versions of which are in the collection; it has not been judged needful to have this paper restored.

Manuscript book, No. 10.—Countermark 922.

Account of Enams and Jaghires granted to the Silladars of the Mahratta army in lieu of payment for fusly year 1204 (A. D. 1795-6).

The covers of this book are much damaged, but the paper inside very slightly so, by insects. The writing is in Persian ink, and indelible. There is however very little writing on each page; and the nature of the contents, as above indicated, is such as not to claim any further notice.

Manuscript book, No. 16—Countermark 923.

" Estimate of the Aurungabad Soubah, with an account of its purgunnahs, circars, mahls, villages, revenues, &c., in the Deckhan."

This is a large book in good preservation, written on French paper, which, as appears from various specimens, insects do not seem to touch, or but very slightly. The contents might have been written in a book one third of the size of this, if filled. In this book there is merely a column running down one side of each page, which contains names and numbers. It is quite irrelevant to the leading object of my enquiries: though in itself a statistical document of some value.

Mahratta Bakheer, a roll of country paper, No. 29.

Fable of *Surpanac'ha* " a giantess."

This is a tale formed on an episode in the *Ramayana*. It is much injured by insects, and could not be successfully restored; even if it were worth the pains, which perhaps it is not.

Mahratta Bakheer, No. 31.

Account of the marriage of *Rucmeni*.

This is a larger roll of similar material, in better preservation but not complete. *Rucmeni* was a princess carried off by *Crishna;* and afterwards married to him; the tale is told in the *Bhàgavata*, in the supplementary portion, and needs no further notice here.

Mahratta Bakheer, No. 32.

Another copy of the same tale; also incomplete, and in not so good preservation.

Mahratta Bakheer, No. 33.

Account of *Sud'hauma*, a poor friend of *Crishna*, enriched by visiting him.

A roll apparently complete, but damaged. It is not of a kind claiming restoration; being a mere tale or romance.

Mahratta Bakheer, a roll of country paper, No. 27.

It is entitled in an English heading—" Modes of discourse between *Cali* and *Paricshit maha raja*;" which would erroneously lead to suppose *Câli*, or *Durga*, to be meant.

The title in the Mahratta is—A detail of the rulers in the *Carnatacadesam*, from the earliest times.

The following is an abstract of the contents.

Mana Paricshitu of the *Pándava*-race ruled down to the year 46 of the *Cali-yuga*. While so ruling, a cow, in a certain forest, was weeping on account of having three of its legs broken. A *Kirata* man (wild savage) going up to the cow, and considering that its three legs had been broken in the three preceding ages, thought it right to break the remaining leg

in the present age (or *Cali yuga*). The above king, then doing penance in the forest, saw the *Kiratan* breaking the cow's leg, and had him put into prison. He said to the king " since I am come by divine appointment why do you molest me ?" The king enquiring who he was, he replied " I am *Cali* (or a personification of the *Cali-yuga*). The king said " while I am alive I allow you to do nothing." *Cali* then requested a place wherein to remain, and the king said, go dwell with * *Himsa* † *Asatyam*, ‡ *Dherma-virodha* and § *Visvásapátaca* While the king lived *Cali* gained no entrance, or ascendancy. The king had four sons, *Janamejaya*, *Sruthusena*, *Bhimasena*, *Ugasena*, who, according to this manuscript, all exercised sovereign power alternately.

Details of their rule are given, and to the second *Bhima sena* is ascribed the killing of the *racshasa*, *Jarasandha* (*Jarasandha* of the race of *Sudherma* is otherwise stated to have been killed by *Crishna*). Twenty descendants of *Bhima-sena* are enumerated, filling a space of one thousand years; they all bore the epithet of *Brahma-hatti*, from the above crime. (Possibly the writer being a devotee of *Crishna*, may have wished to shift the guilt. Moreover the names appear to be given at random, several of them belonging to a later period, and some even subsequent to *Chandragupta*). The minister of *Ribanjaya* named Munica (by *Sir* W. Jones, or by a misprint, *Sunaca*) killed his master, and placed his own son *Pradyota* on the throne. (This event belongs to the *Mâgadha* kingdom). Five successions of this dynasty occurred. In a metaphorical manner *Nanda* is said to have had no child; and his wife, in consequence, threw herself into the *Svarna-nadi* (or golden river), and by reason of doing so produced eight sons. (We know otherwise somewhat of the deposition of *Nanda*, by his minister, leading to the accession of *Chandragupta*, and by the way we may gather from the MS. in hand a useful hint as to the mode in which metaphor and allegory are made to cloud either ignorance, or the truth, as may suit the writer's convenience or caprice. To write the simple truth in simple language, does not by any means appear to have been at any time the *Hindu*-method of composition). The said eight sons, ruled during 137 years. Afterwards a female named *Sada Vrihadra* reigned, and was killed by her minister named *Chacrati*, who placed his son *Srugu* on the throne, which he held for 45 years. (This must designate the *Sunga dynasty*). The minister of *Sruga* named *Canna*, who

* Slaughter, violence, malice. † Want of truth or integrity.

‡ Opposition to equity and mercy.

§ Falling from trust or confidence; the sin of treachery.—All the terms are Sanscrit.

killed his master, and reigned in his stead, was killed in turn by *Susamas* (otherwise *Susarman*) who ruled 456 years (designating him and his whole dynasty, otherwise stated to have consisted of 21 kings). A servant killed him (his last descendant) and ruled the kingdom, and to him is given a period of 334 years. In his time (or that of his dynasty) the kingdom was reduced to great distress. About that time fourteen females of the four colours(castes) came to the *Triveni* (or conjunction of the Ganges, Jumna,* and Sarsoostee rivers) at *Prayaga*, or Allahabad. These while bathing as an act of devotion, each one had a secret wish which was sought to be accomplished. The wish of one of them was that she might have a son who should be emperor of the world. At the same time a poor *Brahman* formed the wish, while bathing and meditating the *Pranava* (or sacred name), that the said woman might be his wife. His wish was accomplished ; and their son was born at *Uchchini* (Ougein) being the famous *Vicramaditya*, who married the aforesaid four females, and ruled 2000 years. (Here again we have the *Hindu* mystic or enigmatical mode of writing; it seems to denote, what is more directly stated in other books, that *Vicrama* was the son of a *Brahman*, by a woman of inferior tribe, the daughter of the king of Ougein. The marriage of *Vicrama* to the four females, being disentangled from the possibly intentional absurdity, means that he married wives of the four tribes). Subsequently *Salivahana* fought with, and killed *Vicramaditya. Salivahana* ruled, on the north side of the *Narmati* (or Nerbudda) and had a son named *Mani-vahana*, and the son of the latter was *Avad'harina* : some others of the race ruled on the southern side of the Nerbudda. At that time a Rajpoot named *Gunt'hivi pati* ruled on the other side of the said river, and the Mussulmans began there by degrees to acquire power.

Subsequently *Bhoja raja* ruled in a large town (*nagara*) named *Baranagara* (in a Telugu account by *Ravipati*, the name is written *Dara pur*). —The names of eight of his decendants are given as follows :—

1. Nanda-rayalu 5 years
2. Uchita-raja 5 years
3. Dor-rayalu 3 years
4. Kerula rayalu 4 years
5. Malata rayalu 9 years.
6. Varada rayalu 6 years.
7. Vishnu palacu 7 years.
8. Tiruvapi rayalu 8 years.

These ruled over the whole of the southern kingdom ; and after them it was divided into two parts. In the *Purva Bhaga* (or northern part†), *Vira*

* *Ganga, Yamuna, Saraswati.*

† Any mention of the southern division does not appear.

Pratapa maha deo ruled over a country called *Ada malun.* The Mahomedan ruler at Delhi, acted perfidiously with the son of *Pratapa,* and took possession of the country. Some descendants of *Bhoja-raja* ruled in the country to the west, as follows :—

Pauna màli rayalu	1 year	Vil parti rayalu	15 years
Narasimha rayalu	3 years	Krivégal	
Podhi rayalu	5 years	Paratu nàma chalu rayalu	6 years
Hari-hara raye	5 years	Trimisha rayalu	8 years
Ana purna raye	9 years	Chera rayalu	10 years
Yelagevi raye	11 years	Vishnu rayalu	12 years
Namivise raye	13 years	Alata giri rayalu	14 years
Chàulata raye	15 years		

in all fifteen reigns: they ruled 138 years in the town called *Baganagara.*

Subsequently some persons descendants of *Bhoja raja,* such as *Nandi rayalu* and others, ruled as follows :—

Nanda rayen,		Kanda rayal	6 years
Rama rayen,	11 years	Sauma rayal	26 years
Vira rayalu,	3 years	Kanda lada rayal	4 years
Rama rayalu,	5 years	Irávata rayal	7 years
Cutta-nadi rayen	8 years	Sindhi d'hana rayal	
Chaya muttu rayen	10 years	Vira vasata rayal	12 years
Chanda rayen	13 years	Búka rayal.	14 years.

In all fourteen persons, who ruled in *Dara nagara,* but at the same time suffering from insufficient means and privations. At length many other persons took away different portions of their kingdom. The violent partition occurred in Sal. Sac. 987. A. D. 1065.

Afterwards one named *Vindhya ravu* performed a penance on the hill of *Sri Sailam* to *Devi* in order to obtain wealth ; whereupon the said goddess appeared to him,and told him his wishes could not be accomplished in the present life ; but would be granted in a future birth. He increased the severity of his penance, when *Devi* again appeared ; and gave a small district around the site of *Vijayanagaram.* The names of his posterity (being the *Rayer* dynasty) are given as follows :

Deva rayal	1 year	Gopa rayal	4 years
Hari hara rayal	3 years	Chokanda rayal	
Buka rayal	5 years	Hatti-rayal	6 years
Képa rayal	7 years	Chaimutu rayal	8 years
Cumal keta rayal	9 years	Kumbalata rayal	10 years

Being in all ten rulers; the termination of their dynasty was in Sal. Sac. 1350 (A. D. 1428). They ruled in all 350 years.

Afterwards *Vira Baktala raye* was seated on the throne at *Vijayanagaram,* in Sal. Sac. 1391. Subsequent to him the country came under the rule of the Mahomedans, and other various persons. Here the manuscript refers to a former communication, and adds that the account was drawn up in compliance with the wishes of MajorMackenzie; but it has no date, and does not give the name of its author.

Note.—This document being a mere roll of country paper, already partially damaged by insects,and liable to early and rapid destruction was restored, on ascertaining the nature of its contents. The absurd English heading could have induced no one to suppose those contents to be of any value. As the case now is, the question is as to authenticity. Some matters at the outset throw a doubt upon the subject. We have accounts of the *Mágadha,* and subsequent, dynasties, in which there are minor differences from this; still the main outlines are preserved, and are in both the same. The list of kings of *Vijayanagaram,*a few names being excepted, differs from the more usual lists, and the names are fewer in number. These considerations are stated because of the very great importance—if authentic—of the middle portion of this manuscript. Of that portion, from the mention of *Salivahana,*down to the violent partition of the *Dara-nagara* country, the account herein given is a translation. Should this portion be authentic, and be proved to be such by other documents, then, so far as my knowledge extends,a chasm in a part of the past history of this country will be in some measure filled up. But I hesitate as to resting more weight of confidence on the document; previous to further confirmation of its statements. The Mahratta language is calculated from the locality of its usage to give more information on that period, and concerning that neighbourhood, than any other; the Gujeratti, or Hala Canada, perhaps being alone excepted.

Manuscript book, No. 10.—Countermark 876.

Section 1. The *Si'hala-puranam* or local legend of *Sangama-Cshetram,* at or near *Chunchuna* in the division of *Yeli* in Mysore.

In ancient times a *rishi* named *Trinabindhya* was doing penance, when *Vishnu* appeared, and told him he could not yet obtain beatification; but that when he *(Vishnu)* came hither as *Rama* then that gift should be bestowed. About the same time a *Kirata-man* (or savage) was labouring to get wealth, when the *rishi* advised him to cultivate the *tulsi* plant, that when *Rama* came it might be used in his service. The *rishi*, and savage, both received gifts from *Rama*. The *rishi* obtained leave to remain at this place, and to build a shrine, with an image of *Rama*, which he accomplished.

A *Pandiya* king having greatly troubled the "divine *Brahmans*," and being greatly afflicted in consequence, travelled to different places on pilgrimage, to get rid of his visitation; and at this place the god met him in the form of an old man, and directed him to build a fane, which he did. This fane having gone to decay was repaired by *Hari-hara-rayer*.

Nareda having visited many places went to *Cailasa*, and there enquired of *Siva*, an account of their origin. Some *Pauraunic* references are introduced, as if stated by *Siva*. There would seem to be a reference to a *Saiva* fane at this place; but the reference is not clear, owing probably to the legend not being complete.

Note.—Though the paper on which this section is written is damaged, yet it does not seem to be worth restoration.

Section 2. Account of *Periapatnam.*

Such is the title in the English heading of the section, and a similar one is written at the commencement of the manuscript. The cause of such a title seems to have originated in the manuscript having been copied (as stated at the end in the Mahratta subscription) from earlier documents by *Narrayana Bhatt*, and *Capavi-Bhatt*, living in *Periapatnam*, and supplied through their instrumentality to the collection.

The contents of the document trace the genealogy of *Raja-Crishna-Udiyar* of Mysore, up through the *Rayer* dynasty, and some intervening races, to *Bhoja-raja* and preceding kings as high as the era of *Yudishst'hira*. But in its order it follows the descending series.

It commences with the mission of *Agastya* from *Cailasa*, his reducing the *Vindhya* mountain, with an obscure reference to the king of the country southward, whom he rendered harmless; * and his going on pilgrimage towards the south. The subject is then confined to the *Cali-yuga*. The era of *Yudishst'hir*, with inclusive reigns, is given. The era

* Compare with abstract of No. 27 in the Mahratta portion of my 3d Report.

of *Vicramaditya*, and of *Salivahana*, down through *Bhoja-raja*, the *Chalukyas*, the rulers of *Deva-giri*, the *Rayer* dynasty, to the royal line of the native *Hindu* sovereigns of Mysore.

Note.—The chronicle is but brief; though relating to a great extent of time. Being damaged, through damp and insects, I have had it restored; since it is a document of some considerable importance; and as such it ought to be fully translated.

Section 3. Account of the *Ărucknath* religion in the Mysore country.

This paper offers nothing, beyond some local regulations for different classes of people, in visiting the shrine of a local *numen*, at a place termed (by accommodation) *Curucshetram* in Mysore. It is not in very good order; but does not seem to be worth restoration.

Section 4. Account of the *Câpâla* religion in Mysore.

This paper relates to the shrine of a goddess named *Capala-matri*, in the same neighbourhood, being a local form of *Devi*, or *Durga*; and is chiefly occupied with panegyric on the said image. It is of no valuable consequence.

Section 5. Account of the fortress of *Balala-rayadurga*, at *Coppahobhalli* in Mysore.

This is a short account of *Roydroog* (or Royacottah as we now commonly term it). Its origin, in this paper, is ascribed to one named *Bakhtala-raya*, under the following circumstances. A *Jaina* ascetic greatly troubled the people of the neighbourhood; and the said *Bakhtala*, professing to become his disciple, did homage at a shrine of *Rama*, and by virtue of that penance acquired the power of killing the ascetic; and, for so doing, the people gave him rewards. With the measure of wealth so acquired, he gathered people around him, and plundered: by the accession of means so acquired, he further strengthened himself; conquered an extensive district: and first built the fortress of *Rayadurga*. He was named *Deya-vina-athi-raya*; and he had three sons named *Bakhtala-raya*, *Vishnu-verddhana*, and *Deya-vina-raya*, of whom the first

was a *Saiva*, and the second a *Vaishnava*. At an early period the place seems to have been subjugated by the Mahomedans; and some mention occurs of changes under their rule.

Note.—This paper appears to be an imperfect account of the origin of the *Oyisala* dynasty, which ruled at *Hobhalli;* and was at one time of considerable consequence. The paper is brief; complete as far as it goes; and being somewhat damaged, has been restored, for its better preservation.

Section 6. Account of *Chandragupta-cshetram*, in the province of *Bidanur*.

A legendary reference to the sacrifice by *Dacsha;* the self immolation of his daughter: the anger of *Siva*, her husband; and the formation of *Vira-bhadra* in consequence. The paper is incomplete, and seemingly worthless.

Section 7. Legend, or *St'hala-purana* of *Killadi*.

This is a mere local legend; apparently of little or no consequence.

Section 8. Account of *Halla-bede* in *Bidanur*.

This paper entitled as above, in the English heading, is another, and fuller, account of the *Balala* rulers at *Rayadurga*. The like account, as in a former paper, is given of the killing of a *Muni*, herein termed a *Saiva*. The account of the posterity of the founder of the dynasty is more full, than in that paper (sec. 5), and it is herein stated that as one part of that posterity was of the *Saiva*, and the other part of the *Vaishnava* persuasion, they fought with each other. One of the race was cured of leprosy by building a great many *Saiva* fanes. Another of the race, marrying a Mahomedan woman, was driven away by his father. He went to the Padshah, who came and took Roydroog; and, causing the before expatriated son, to be crowned at *Vijayanagaram*, he placed him as feudal chief at Roydroog. A list of his descendants, and details of their wars, with other proceedings, follow.

NOTE.—This paper being much damaged by insects, and damp, has been restored; and it merits full translation, as a valuable document, relative to the *Oyisala* kings.

Section 9. Account of *Copam* in *Bidanur.*

A reference to the anger of *Siva* in consequence of the self immolation of his wife, at the sacrifice of *Dacsha;* the place receiving its name from that circumstance, as if it had occurred there. A *Saiva* named *Cópa*, built there a hut; and afterwards *Jina Danda-raja* made it a metropolis, building a fort there. Having no offspring he gave it to a *Brahman*. *Siva-danda-nayak*, afterwards ruled. A few other names are mentioned; who, by their cognomens, would seem to have been *Brahmans.*

NOTE.—The document is much damaged; and, as it may have some historical value, it has been restored.

Section 10. Account of the *Cáveri*, in the *Cannaba* district.

The account of the *Caveri* is only promised, but not given. It is little better than the legend of a fane; chiefly having reference to a leprous king, who, it may be anticipated, was to lose his disease by bathing in the *Caveri;* but the document is unfinished, and appears to be of no importance.

Mahratta Bakheer, No. 23, a roll of paper.

This document is incomplete, both at the beginning, and the end. From the remaining middle portion of the fragment it is found to relate to revenue, and other, details of the Peishwah. His treasurer had made false accounts; and, these being detected, he was summoned to follow the Peishwah to a place whither the latter annually went on pilgrimage. The treasurer did not do so; and forcible measures were resorted to, in order to compel his attendance. There are further some details of marches, and mention of some towns, or places, taken.

The document is damaged by insects and damp; but as being a mere fragment, and without matter of permanent interest, its restoration has not been deemed requisite.

Manuscript book, No. 5—Countermark 917.

Contents. A short account of the revenues of the fifteen Soubahs in Hindustan, under the government of Acbar, Padshah of Delhi.

This book has but a slender proportion of matter compared with its size. It is written on French paper, and is in good preservation. The subject of course is incapable of being abstracted; and the contents in themselves are brief. As a statistical document it can at any time be referred to, if requisite.

Mahratta Bakheer, No. 28.

A large roll of paper "Genealogical account of *Malogi* and *Vitogi Bhosala*, princes of the Mahratta dominions."

This document has the beginning; but is not complete at the end. As far as it proceeds it contains a somewhat full and curious detail of the origin of the Mahratta chiefs from *Babaji Bhosala;* whose two sons *Vitogi*, and *Malogi*, were soldiers of fortune. Their adventures and services are mentioned, especially under the Delhi Padshah; until, by an adroit use of circumstances, their descendants became princes.

The important part acted by the Mahrattas might perhaps render the genealogical detail worth full translation. The document is in tolerably good preservation, with a slight exception at the beginning; and its restoration does not seem to be urgent; though it may possibly hereafter claim attention.

Mahratta Bakheer, No. 8—Countermark 920.

A roll of country paper, entitled "Genealogical account of *Nanah Saheb* of the Peishwas."

This document contains a rather full historical detail of the branch of the Mahrattas, established at Poonah. At the beginning *Appaji* Saheb is represented as enquiring into the past history of his race; which is narrated to him by the author. At the close, a copy of this document is said to have made, by special request, for Major Mackenzie. The roll of paper is a large one; and it is surprising that the matter should have been written on such a fragile material. It is damaged in various places, and words are eaten away by insects. The matter however is for the greater part recoverable, and the document is complete. For these rea-

sons, and especially from viewing the details to be of considerable consequence, the document has been restored; and I am of opinion that it merits full translation.

Manuscript book, No. 19—Countermark 885.

Account of Hyder-Nayak.

This is a small book, and contains chiefly statistical details. It gives a statement of the towns, or places, conquered by Hyder Ali; amounting to one hundred and twelve. There is a detail of the strength of his army, with the number of his cannon and muskets. The names of his ministers, and officers holding official or revenue charges, are given; and a statement of the districts, or towns, wherein they exercised their various employments. It is dated in April of the *Crodhana*-cycle-year; but without a more definite date.

The book is somewhat injured by damp, and a very little by insects; but the writing throughout is perfectly legible, and restoration does not seem to be required.

Manuscript book, No. 12—Countermark 878.

Section 1—Memoir of Hyder Nayak.

This paper contains a somewhat lengthened account of the life and actions of Hyder Ali; but it is not complete, breaking off abruptly.

His origin—family connections—rise from obscurity, in being made a commander of 2,000 cavalry—are mentioned; and the various steps are then detailed by which he acquired additional power, and set aside his former master; the wars in which he became engaged are specified. The abrupt breaking off is at the period of an interference with the Coimbatore province; at which time he was sixty years of age.

It does not seem necessary to make a minute abstract, seeing that the general events of Hyder's life are tolerably well known. A translation in full might nevertheless be curious. The document is written on French paper, which insects do not touch, and the ink is permanent; consequently nothing further is needful to be done with it for the present.

Section 2.—Account of *Siva Samudram.* This is a legend of a district, with its fanes, not very far distant from Seringapatam.

The origin is dated beyond the era of *Rama-Chandra* who, it seems, visited the spot, when dwelling in the wilderness. There does not appear to be in it any thing of importance. The papers concerning Mysore seem to agree in stating, that *Rama* went by way of the Mysore country to *Lanca.*

The document is in sufficiently good preservation ; but it is not complete, and breaks off abruptly. A pencilled memorandum by Colonel Mackenzie dates its receipt by him in 1800.

Section 3.—Memoir of Tippu Sultan.

This paper commences with a reference to the siege of Trichinopoly. The presence of *Nanda raja* of Mysore—the capture of a province—the power acquired by Hyder—the intention of the latter to capture the town of Madras—his negociation with the Mahrattas of the Peishwa to keep them off—and the pecuniary terms on which they consented to be bought off—are narrated. The document is then somewhat full in its details of Tippu's operations; chiefly against the English. His conduct at Vellore—his ill-treatment of his prisoners—alliance with the French—are stated. Affairs at Trichinopoly are detailed. The document breaks off abruptly, without a proper close.

Note.—It is written with permanent ink on French paper, is quite uninjured, and can be easily made the subject of reference. By consequence it claims from me no further attention. It is endorsed in Colonel Mackenzie's hand-writing—"Life of Tippoo Sultan from Colonel Close, September 7, 1800."

Section 4. Account of Budda Ballapur in Mysore.

This document relates to a district locality, of which the proper name seems to be not Ballapur, but *Bakhta-puri.* In fusly 948 (A. D. 1539-40) three individuals of the *Canchi* district, unable to support the distress (cause not stated, but most probably the *Rayer's* invasion) fled from that country, and went above the *Payinghat,* where they constructed huts to live in. While there some other individuals, subjects of the *Rayer,* returned from a pilgrimage to *Ramiseram,* and lodged with the new settlers. Three boxes came down the river; on opening which they were found to contain images of *Nandi, Narayana* and *Gopàl.* The finders made their supplications; and, in the night, a vision appeared

directing them to abandon these huts; pointing them to a place where buried treasure was to be found; and directing them, with it, to build a town and fanes. They followed the directions given; obtained the treasure; and came to an open plain where formerly a *Jangama* shrine had been. Here they determined to remain. They accordingly built a (mud) fort, with a town, and repaired the old *Jangama* shrine. The leader is termed, *Baktipuri*-sultan, who acquired the power of a local chief, and transmitted his authority to his descendants. After some time the place was captured by the Mahomedans; subsequently by the Peishwa's Mahrattas; and still later by the English.

Note.—The locality is I believe on the western border of the Mysore country. As a local paper it is of some value. It is in a perfect state of preservation.

Manuscript book, No. 9—Countermark 875.

Section 1. Account of *Asubjah* (Asuphjah) Nizam-ul-moolk, collected in Mysore.

This paper wants eight half sheets at the beginning, and is not complete at the end. It contains a statement of the Nizam's proceedings at Delhi, and in the south; mentioning the places subdued, or brought under him, and paying tribute. There is a full specification of his officers, civil and military, and of the districts controlled by them. Mention is made of Monsr. Bussy, and of the interference of the French, in the affairs of that part of the country. A combination of various powers was formed; in which Hyder, the Peishwa, the Guicovar, and others, were concerned; who fought with the Nizam, and took Hyderabad. Some other affairs with Delhi, and wars; in the midst of an account of which the document abruptly breaks off.

Note.—It is written on good French paper, with permanent ink; and is in perfect preservation, though incomplete.

Section 2. Some account of *Anagundi*, collected in Mysore.

This paper relates to a period subsequent to the overthrow of the *Rayer's* power. A Mahomedan collected a few people; and pretended that he was authorized from Delhi to assume the feudal principality of

Anagundi, of which the shadow of royalty there, being afraid, bought him off with a sum of money. On a subsequent reference to Delhi, the ruler there disclaimed any knowledge of the transaction, and any intention to disturb, the *Hindu* prince in the possession of his fief. On learning this circumstance, the said *Hindu* ruler became greatly incensed, and, wreaked his vengeance on all whom he could lay hold of, that had been concerned in the plot, and imposition, practised upon him. A list is given of the persons whom he put to death.

Note.—The document is uninjured.

Section 3. Account of *Hastinavati* or Delhi.

This is a brief statement, commencing with the era of the *Cali yuga*, and coming down to the time when the name was changed to Delhi, with the mention of some kings. *Salivahana* and *Bhoja-raja*, are adverted to, as distinct persons; and, after the latter, *Kailasa-raja*, which seems to be a titular name.

Note.—The document does not appear to be of much consequence; and it remains uninjured.

Section 4. Account of the arrival of Tippu Sultan, at *Devanahalli.*

A very short, and unfinished, paper; containing a memorandum of some of Tippu's proceedings; but breaking off abruptly, and of no value.

Section 5. Account of a tobacco contract with Tippu Sultan.

Notice of a farming transaction. *Tippu* leased out lands to cultivators of the tobacco plant, on certain conditions; whereby he obtained a considerable revenue.

Section 6. Some account of the settlement of Tippu Sultan.

According to this document an attempt was made to establish what is now called the *ryotwar* system of cultivation, which failed; so that the system of *mirasidars*, or *zemindars*, was re-established. Some

other mention of revenue transactions; in the investigation of which Tippu was greatly incensed, and hanged two of the principal persons concerned.

Section 7. Account of *Bijnagara* collected in the Mysore country.

The commencement is legendary. A Brahman unable to sustain the pressure of a famine which prevailed, did penance with a view to obtain wealth. The god at first refused his request, but afterwards granted it, when he had no longer any desire for it; so that he bestowed it on a *Cshetriya*, or *Rajputra*, who built a town, and made himself a district chieftain. At a later period transactions in which Mahratta generals were concerned occur: but the narrative breaks off abruptly.

Note.—This document is written in pale ink, and is slightly damaged. As there is something of real history contained in it, I have had it recopied.

Manuscript book, No. 22.—Countermark 934.

Section 1. Account of *Calikapuri*, and of *Bhoja raja*.

Reference to the *Pandava* race, down to Sal. Sac. 58, when *Bhoja-raja* ruled. He conquered in the north, and erected a pillar of victory (*jaya stamb'ha*). To the south the *raja* of *Cambhira* averted an invasion by submission. *Bhoja-raja* ruled in *Calikapuri*, and made great addition to its fanes, and other buildings, including seven *Saiva* fanes. He ruled down to Sal. Sac. 124, with great celebrity. Subsequently *Ranga-Yadava rayalu*, with his successors, and the Delhi Padshahs, with their successors, are given in detail. The narrative comes down to the period of a war between the Delhi Padshah, and Hyder Nayak; with the mention of which the document ends.

Note.—This manuscript appears to be of considerable value, and meriting full translation. At present the writing is in good preservation. The material written on is country paper, which insects have begun to attack chiefly in the margin. The document will require to be kept in view, and to be looked at occasionally; but its restoration is not at present of urgent necessity.

Section 2. Tale of *Vicrama*, prince of *Uchchini.*

This is one of the popular tales concerning *Vicramaditya.* It is in a rather more deteriorated condition than the preceding section; but there is nothing in the tale to merit the process of restoration.

Manuscript book, No. 36.—Countermark 948.

Contents. Another copy of the 25 tales of the *Vetala.*

With a few slight exceptions at the beginning, and at the end, this book is in tolerably good preservation. It is a version of the tales of *Vicramaditya's* attendant-demon, or *Vetala.* They deserve no serious notice in researches of the present kind, and it is to be regretted, that the commonness and popularity of such kind of tales, have a tendency to detract from the general value, such as it is, of Hindu literature. A vitiated, and morbid, taste can alone be gratified by such kind of productions; and they convey a low estimate of the people among whom they are popular.

Manuscript book, No 5.—Countermark 871.

Section 1. Account of *Muluvacal* in Mysore.

The account was written in May 1837, from the statements made by *Asaman* the *Amin*; *Kalla rao* the *Serishtadar*; and others. The statement is wildly legendary. The ancient name of the place was *Mat'hapur.* It was visited by *Rama* and *Sita*; and was chosen as a suitable place for the penance of *Valmica.* In the time of the great war, *Hanumàn* assisted *Arjuna;* and the latter greatly admired the former's bravery. The hill in the vicinity afforded a refuge to the *rishis* during that war. At a later period many fanes were built here, as the spot was esteemed sacred. Its subjection to a native prince is stated; and its subsequent assumption by the Mahomedans. Towards the close of the paper there is a reference to the war against Tippu, conducted by General Harris, Colonel Close, and others; in which war Tippu was slain by a cannon shot, and his country was taken.

Remark. The paper being written down from verbal statements, and being of a legendary character, does not seem to offer much of conse-

quence. It is very legible; and the paper but slightly injured. Hence it is passed by, without any further attention.

Section 2. Account of *Chandradrona* hill, or *Vayvu-parvatam*, in *Bidanur.*

During the residence of *Rama* and *Sita*, in the wilderness, *Hanumàn* went as far as *Nasica* (Nassuck), to see them. After the abduction of *Sita*, the said *Hanumàn* sought every where through the south, in the caves, and hills, in order to find her. Among other places he came to this hill; and gave it a name. During the war, when *Hanumàn* carried a mountain through the air he let fall a portion of it here, which hence became named *Chandra-drona*, after its original name, in its former site. The sound as if of singing is heard within it. It was waste during the *Dwapara-yugan*. At a later period it became a *Jangama* fane. There is some similar legendary matter, about *Crishna* and *Arjuna*.

Another account of the same hill.

The same tale of the falling of a portion of the mountain carried by *Hanumàn*.

NOTE.—The damaged state of this paper would have indicated its restoration, if worth it, which seems not to be the case. As a passing remark, the great influence exercised by the *Ramayana* and *Mahabharata*, may be noted, and must frequently have been observed in foregoing portions of these abstracts. The wildest inventions, when grounded on incidents mentioned in those poems, seem, every where in the south, to be received with implicit credulity. No doubt this hill, termed *Vayavu-parvatam* or "the hill of wind", must have something remarkable about it. I regret the want of local knowledge concerning it, on grounds quite different from this legendary fable.

(*Section* 3. to 6, in the Canarese language; omitted under the head of Mahratta writings).

Section 7. Account of *Shahuni* or *Hossein-pur.*

The original and legendary formation of the place is ascribed to *Shakuni*, a woman of the *Caura* tribe, who provided curds for the five *Pandavas*. At a much later period a chief, named *Vira-bhadra-nayak*, cut down the wood, cleared the ground, and established a colony, building a

fane to *Vira-bhadra*, the titular *numen* of his tribe. Still later the town, and district, came under the government of Tippu; when its name was changed to Hossein-pur.

Note.—The document is in sufficiently good preservation.

Section 8. Account of *Vitala-pur*.

A reference to *Magada-desam*, and the mention of a few names and incidents, when the document abruptly breaks off, without the promised account of *Vitala-pur*, which it may be conjectured, was to arise out of it. That *Magada-desam* (not *Mágadha*) was above the ghauts, in the province now called Bidanur, is a little point of geographical information, helping towards an explanation of the fifty-six countries of the *Hindu-puranas*.

Section 9. Account of *Nanda-ram*, an aged man of the *Rajputra* caste at the village of *Tanchar* in *Bidanur*.

He was originally of *Joudhpur;* his family being gold and silver smiths. He followed the army of a Padshah, as a sutler; supplying pease and wheat, for horses, and men. He afterwards became employed by Hyder Ali, and was sent to Masulipatam. Some mention of Hyder Ali's relations is added.

Note.—It is difficult to say what could have led to suppose a biography of such a person to be of any consequence. It seems to be of no value.

D.—SANSCRIT.

A Palm-leaf Manuscript, without label or number.

This very old, and greatly damaged, MS. on examination was found to be a fragment of a Sanscrit work in the *Grant'ha* character, composed by *Bava Bhupati*, one of the poets of *Bhoja-raja's* court. The leaves are eaten, in many places, by insects, others are lost: two sections, and part of a third, are found. The subject is of no historical consequence; and, as far as can be ascertained, contains merely poetical panegyric, as a sort of epithalamium.

Manuscript book, No. 50.—Countermark 1019.

Detached inscriptions at Conjeveram and *Srí Permatur*, in Sanscrit, *Grant'ha* character. No. 90. Dated in Sal. Sac. 1436. A long enumeration of the titles of *Crishna rayer* of the *Yada vamsa*, with the mention of some of his ancestors, deduced from the usual lunar-line. Much panegyric is bestowed on his munificence, to many other fanes; and, at the end, it is stated that he erected a magnificient cupola over the shrine of *Deva-raja*, or *Varada-raja*, at Conjeveram, in which there is much gold employed in the workmanship.

Remark. The cupola was taken down some years since, as I am informed, and has not been rebuilt; because of the great expense which would be required.

No. 100. Commemorates the munificence of *Laschmi-Cumara-acharya*, in causing a large and magnificient tank, or reservoir, to be excavated near the fane of *Hanumân*. Some panegyrical stanzas are added.

No. 101. Dated in Sal. Sac. 1591. Commemorates an endowment by *Sena Muthaliyar* for the purpose of certain chants, and ceremonies, performed at the first offering, or using, of water from the *tirt'ha* (or pool) in the washing, or bathing, of the image in the fane of *Varada-raja*.

No. 135. Dated in Sal. Sac. 1432. It commemorates the grant, in free tenure, of several large, and valuable, villages to the *Saiva* fane of *Yecambesvara*, by *Crishna rayer*.

No. 136. Dated in Sal. Sac. 1536. Commemorates donations made by *Tattácharyar*, which are specified; but of which the detail, in this place, seems not to be required.

CONCLUSION.

This Section of my general report here finishes. The necessity of any further remark seems to be obviated, by the observations offered, at each step of progress.

Madras, *June*, 30*th* 1838.

II.—*Notes on Ryotwar, or Permanent Annual Money Rents, in South India: and on the duty of Government in Periods of Famine.—By* John F. Thomas, *Esq. of the Madras Civil Service.*

To estimate the effects of a system of fixed annual money rents, in the present state of Southern India, it would appear necessary to keep the following points prominently in view. The peculiar circumstances of the agriculture of the country, the character, and present condition of the ryot, or landholder, and the state of society around him—and let us contrast the ryot in these respects, with the occupant of land in countries where annual money rents, as in Europe, have been for a long period the settled usage.

The ryot, or farmer, in the Peninsula of India is placed, we may first observe, from physical causes, in essentially different circumstances from the occupant cultivator in Europe. The intensity of unpropitious seasons in the temperate zone, especially in the case of drought, never being such as in tropical or Indian climates; whilst the variety of soil further secures the European farmer against *a total failure* of his crops. An unusually wet season in Europe causes the light soils to yield abundantly; and the dry year produces heavy crops on the deep land. It never occurs therefore, that the European holder, does not obtain some considerable return of produce from his land in each year; and though this return may frequently be below an average crop, yet the enhancement of price at these periods, consequent upon the great extent of the purchasing population,* at all times compensates him, for deficiency in the quantity of his produce, and his yearly money rent can invariably be paid therefore with little difficulty from the annual out-turn from his land.

But in Southern India, in seasons of drought, instead of any considerable return, there is frequently not a single field in the entire range

* Agricultural, or producing population in England 35 per C.—non agricultural or purchasing 65 per C.—Agricultural or producing population in India 90 per C.—non-agricultural or purchasing 10 per C.—See Babbage and other authors on the statistics of England.

of a ryot's farm, which is not either wholly barren, or very greatly deficient in produce. Often on the larger portion of his land, not an ear of grain is left, and the seed has not been returned to him: and even if some few showers should have fallen, and his well land has yielded a crop, he has still not a fifth or often a tenth of his ordinary crops to reap. No increase of price, it is plain therefore, can avail a ryot ought at these seasons; for he has no produce to bring to market, or but such a fraction beyond the wants of his family, that his entire crop will not give him any thing like the amount of his annual rental. The extreme pressure upon him consequently at these periods, arising out of the *physical* circumstances under which he carries on his occupation, places him in a wholly different position from the landholder in Europe: and in one, I believe, for which no providence, nor industry, can fully prepare him, if his full annual tax, or rent, be required from him, as prescribed by the present system, at a period, when he has lost nearly the whole of the year's outlay upon his land, and has not reaped grain enough either for seed, or to maintain his family through the year.

It is this peculiar feature of South Indian agriculture, resulting from physical causes, an almost entire failure periodically of nearly all return from the land, which constitutes a marked distinction between the circumstances of the Indian, and the European farmer or occupant of land, and which renders *fixed annual* money rents at their present rates, however advantageous in Europe, of doubtful policy in this country. When strictly acted upon for a series of years, it will, I believe, be found, that the heavy demand which this system makes upon the Indian landholder at seasons of extreme difficulty, and of peculiar loss, sweeping away at such times the whole of his little capital, or involving him inextricably in debt, is one of the chief causes of the present general impoverishment of the ryots. It is also to his knowledge of the certain recurrence of the periodical droughts, and their consequences; so fully appreciated by the ryot, but not yet, I am disposed to think, sufficiently considered by his European superior, that we must ascribe it, that he has been generally led to prefer a heavy; and vexatious tax in kind, of even 50 per cent of the *actual* annual produce, varying therefore with the season, to any permanent rent in money, at a lower rate. For he knows, that he is, under that tenure, protected in the season of drought, from a heavy Government demand,

which he has no produce to meet and which must entail upon him ruin.*

It is deserving of remark, that these seasons of very severe drought where the seed is not returned, and which are known by a peculiar term, recur on an average in the southern provinces of the Madras presidency once in seven years. From acconnts before me from Coimbatore, and Trichinopoly, five years of this kind are named within the last 33 years.

But it is not only in the want of adaptation to the peculiar physical circumstances of the agriculture of the country, that fixed and invariable annual money rents are open to objection ; they appear also unsuited to the present circumstances of the great body of ryots. The mass of the land is held in very small parcels, by proprietors of petty tenements under 30 or 40 rupees. Proprietors of this class can possess little or no capital, and very limited credit, and that only upon ruinous, and usurious terms. How is it possible then, that they should be able to meet all the contingencies, both of price and season, affecting so large a proportion, as the Government share of 33 or 45 per cent of the average annual produce of their land.

* "Their objections (the ryots of Trichinopoly) are stated to have been, that if the land be once assessed at a specific sum in money per cawney, a fall in the price of grain, or an unfavourable crop, will make the payment of the Government dues extremely difficult. Whereas, at present, we suit our consumption to our actual produce; and in the event of a deficient produce, although we cannot consume so much as we should in a favourable year, we have still sufficient to maintain our families unburthened with any payment, unfettered by any penalties. *We preserve our lands*, and if we do not grow rich, at least *we are not utterly ruined.*

"They alone must be the judges, whether it is more beneficial for them to pay a proportion of the produce in kind, or, a fixed sum an equivalent in money."—*Madras, Rev. Sel. vol.* III. p. 519.

"In many cases, too, the objections (of the ryot) to fixed money-payments appear to be well founded. The precariousness of the produce and the poverty of the cultivator, rendering it necessary that the rent should either be paid in a proportion of the crop, or that the ryot should adopt the less advantageous mode, of trusting to an undefined understanding that a part of the stipulated rent will eventually be relinquished".—*Madras, Rev. Sel. vol.* III. p. 158.

"During my late tour through this territory (Dehli, &c.), the dissatisfaction of the zemindars at nukdee or money-settlements was almost universal, the inconvenience to which they have been, in consequence, subjected from bad seasons, being of a species unknown to them formerly".—*Rev. Sel. vol.* III. p. 415.

"The disadvantage immediately resulting from this system, and which constituted the chief difficulty in effecting village rents, was the balance left out-standing at the end of the year, the account of the Circar grain remaining unsold; and the difficulty of converting it into money, so as to realize the revenue within the year. The inhabitants aware of this difficulty, were averse to the responsibility of a money rent, and the actual experience of many years justified their apprehension".—*Rev. Sel. vol.* I. p. 562.

The ryots of Southern India are also, like all individuals of limited means and education, improvident. They are in eight cases out of ten in debt.* It must surely be idle to look to them, for the forethought which shall store up every small gain of a favourable year, to meet an adverse season. This providence can and does exist, only in educated and highly civilized communities, and is the very reverse of the national characteristic of the Indian agriculturists; not one of whom from high to low, scruples to involve himself irretrievably in debt for marriage or funeral ceremonies. A system therefore, which throws upon the Indian cultivator, the whole onus of providing for every emergency, and requires from him the forecast, to meet all the variations in the market, as well as those of the seasons, is manifestly ill adapted to his present character, and condition, and little calculated to enable him to realize property in the soil.

The system is likewise, I conceive, unsuited to the existing state of society in Southern India, of which the preponderance of the agricultural class is a peculiar feature. This feature of Indian society renders the demand of a permanent *annual* money rent, not only highly disadvantageous to the ryot, but, it may even be said, unjust. For the large excess of the agricultural population over all the other classes, of not less than eight to one, necessarily brings an immense surplus of grain into the market in favourable seasons. Prices in consequence fall exceedingly low, there being no foreign vent for grain in Southern India; and the ryot, in lieu of gaining largely, not infrequently receives less money for the whole of his crop brought to market, in productive years, than in an average season, or in one a little below it. He therefore finds more difficulty in paying his money tax at such periods; and he may be now occasionally even a loser, and his gains must at all times be very inconsiderable in abundant and favourable seasons. Whence then in the present state of society is his profit to come from, to meet the loss and deficiences of unproductive years, and of seasons of excessive drought? The rule now in force, of an invariable annual demand in money on an average crop, and at average prices, makes no provision for this peculiar condition of society. It is assumed, in the teeth, I think, of facts, that the profits of favourable seasons, always are, and will be adequate to meet the demand of unfavourable years; and the whole burden of failure in the season, or fall of price,

* "The difficulty lies in the character of the ryots whose improvidence renders them to so great a degree incapable of realizing property when the means are put in their power."—*Court of Directors, Rev. Sel.*

"The debts and embarrassments in which the whole of the agricultural population is plunged." Mr. Elphinstone.—*Jud. Sel.* iv. p. 14. 3.

is, under the existing system thrown on the poor occupant of a 30 rupee tenement to his utter ruin. There is also, a further disadvantage to the ryot in money rents, which does not exist under the native practice of a division of crop. Under that system, bad as it is in all other respects, there is this advantage, that the Government dues are only taken, when the ryot is best able to pay them, at the precise moment at which he has gathered in his produce, when it is easy for him to assign to Government its portion, and he has then no subsequent demand to meet. But under ryotwar money rents, the entire crop is left upon the ryot's hands, and all the risk of subsequent fluctuations, falls upon him. The rents in money are also usually exacted with such unsparing and rigorous punctuality, that the great body of the ryots from their want of capital, are practically compelled, in order to pay the Government dues, to bring the whole of their grain to market at a loss within the year. Whereas, had the rents been taken in kind, the Government would have stored a large portion of the year's crop for future consumption, and much would have been kept out of the markets: the share left to the ryots would have been brought consequently to sale gradually, and against it is probable less competition, and to a better market, even allowing for the diminished demand which must result, when the revenues being received in kind, Government payments are also made in grain.

In the foregoing remarks on the circumstances of the south Indian ryot, arising out of the peculiar nature of the agriculture of the country—his own habits and present condition, and the state of society; we have only considered the effect of permanent annual money rents in cases, in which the landholder (the ryot) or the party answerable for the Government tax, and the actual cultivator of the soil, is one and the same. Let us now view the subject where the tenure of land is different, as in provinces like Tanjore, where the land is in the hands of proprietors who do not themselves till it, but enjoy a landlord's rent. Where therefore, property in the soil has not to be created but actually exists. It will then I believe be seen, that the rule, which prescribes an *invariable* annual demand in money, is not merely unsuited to the circumstances of the landholder, but if not modified, absolutely destructive of his well-being and to the existence of all saleable property in the soil.

The gross produce of the wet land in Tanjore irrigated by Government works, is divided upon an average nearly as follows; 50 per cent. the Government tax or assessment, 25 per cent. charges of cultivation or an allowance to the actual cultivator (the occupant *cudi*), 12 per

cent. village cesses ; total 87 per cent. leaving about 13 per cent. as the merasidar's, or proprietor's rent. From this, the merasidar supports his family, keeps the minor water-courses in repair, provides advances of seed and stock for the occupant cultivator, and under the new ryotwar system of fixed annual money rents, he takes upon himself the risk of the fluctuations of season, and of price on the Government share. The Government relinquishing to him upon this ground 5, or 8 per cent. of its share, and he is expected for this consideration, to bind himself for an *invariable* annual payment to Government, of 45 or 42 per cent. of an *average* crop, at a fixed price.

The cultivators, or occupant *paracudis*, unable to take any part of this responsibility, continue the ancient usage of a division of the crop. They at all times receive their share of the produce in kind, and at all seasons also, the merasidar has an outlay of 2 or 3 per cent. from his own share, on the water-courses, and in advances of seed, besides his payments in village cesses. His annual liabilities are therefore not less than from 80 to 85 per cent. of an average crop, of which, under ryotwar, 40 to 45 per cent., is further commuted into a certain and invariable annual money payment. If crops are deficient in any season 15 or 20 per cent., he receives little, or nothing. The whole produce is barely sufficient to cover the Government, the *paracudis*, and the village demand. If the returns should be still less, i. e., if there should be even so slight a variation, as 10 per cent. of decrease in price below the standard, combined with 15 per cent. in produce, he is most seriously affected. These minor fluctuations he can stand for a short time, for his land is saleable, and his future returns, as they depend upon the south-west monsoon, sure he can therefore command credit at a moderate rate. But if prices, and produce should in one or two seasons both fall 20 or 25 per cent., a total of 40 or 50 per cent., his final bankruptcy is almost certain, and as seasons of this kind always occur in the course of every eight or ten years, the eventual destruction of property in the soil, under this system at the present rates of assessment, appears inevitable.

The merasidars of Tanjore have seen this, they have in consequence strongly opposed the ryotwar invariable money rents, and have proposed these terms. That when produce is deficient 20 per cent., or upwards, they shall revert in effect to the old usage of an equal division with the Government of the actual crop.

The justice, not to say necessity of this provision under merasi, a tenure, which allows a proprietor's rent, as well as a Government tax, will I should think be admitted, if we consider—that the gross re-

ceipts of the merasidars, cannot in the best years exceed 25 or 30 per cent. of the produce, that independently of the share apportioned to the *paracudies*, the merasidar pays from his own share of the produce, a further part of the charges of cultivation, in finding the seed, and repairing the minor water channels, and that his family is to be maintained, and clothed from the produce left to him after all outgoings have been provided for. His largest net surplus profits therefore can scarcely, at any time exceed 8 or 10 per cent. per annum be he ever so prudent. And it must be impossible for him, with an annual surplus of this extent, to undertake the liability for a permanent 42 or 45 per cent.; in a country, where crops often fluctuate, 30 per cent., and where price in abundant years sinks 50 or 60 per cent. and even more.

The following memorandum of the produce, and prices, in one of the richest of the talooks in Tanjore (Sheally) in the four years immediately preceding the introduction of the ryotwar money rents, affords a striking instance of the fluctuations to which both prices and produce are subject in this country, even where the lands are watered by the south-west monsoon.

Years.	Produce of the Talook.	Prices.
Fusly 1233 .... A. D. 1823-4........	5,37,000 cullums....	1 R. per cullum.
Fusly 1234.......... A. D. 1824-5........	7,14,000 do.... ..	1 R. 2 Annas do.
Fusly 1235.......... A. D. 1825-6........	5,91,000 do.... ..	—— 8 Annas do.
Fusly 1236.......... A. D. 1826-7........	8,24,000 do........	—— 7½ Annas do.

We see here, in the short term of four years, produce fluctuating 30 to 40 per cent., or from 5 to 8 lakhs, and prices 130 per cent., with the remarkable feature, that in the third year fusly 1235, produce *decreased* nearly 20 per cent. on the previous year, not the best of the four, and prices fell at the same time more than 120 per cent., making a total fall on the preceding year of 140 per cent. These are the fluctuations in the short period of four years, and there is no reason to doubt that like variations in produce, though it is probable, not to the same

extent in price are common. Where such great fluctuations exist, it must, I think, be evident, that a proviso, for casting upon Government in seasons of great decrease of price, or produce, its full share, if not the whole of the deficiency, is absolutely necessary, or the proprietor will be in a few years ruined, by the large and varying demands which he is unable to meet from the annual produce, and all trace of property in the land must eventually be swept away.

So little attention would seem to have been hitherto paid to this effect of an invariable annual money demand, especially *under the different species of tenure*, that this very proviso in the permanent field assessment of the Tanjore province, which is essential to the existence of merasi tenure, in other words, of property in the soil, has been pronounced by high authority (Proceedings of Government 1833) wholly indefensible, as at variance with Colonel Munro's ryotwar of the Ceded Districts. That it is a departure from that system is palpable. But the question is, is it not absolutely necessary to the existence of proprietary right, not only in Tanjore, but elsewhere; and is it not a further evidence that the ryotwar system of permanent money rents is ill adapted to the circumstances of the agriculture, to the state of the landholder, and to the condition of society in this country.

In support of this opinion we may adduce the fact, that although the ryotwar system of a fixed *annual* money demand for each field occupied by the ryot, without reference to the annual out-turn from it, has been professedly in force in this Presidency for many years, it has rarely, if ever, been carried out. In the Ceded Districts, and other ryotwar provinces, a departure in practice from one of its fundamental rules has been admitted for years, by the grant of remissions; but more especially by the practice of not making the annual settlement (*dittam*) for the ryots holding, till towards the close of the year, and then determining his rent, not by the actual extent of his occupancy, and his cultivation during the year, but by his productive fields.—Thus throwing the risk of season on the Government, and annually regulating in fact the demand of revenue in a province in each year, by the character of the season, by the crop reaped, and the number and extent of the productive fields of the ryot, and not, as ryotwar prescribes, by his occupancy.

The 7th rule of ryotwar stands thus (see plan of ryotwar Colonel Munro's letter 15th August 1807, appendix to 5th report p. 944). "No "remission shall be made on ordinary occasions of bad crops, or other "accidents should failure occur which cannot be made good from the "property, or land of the defaulter, the village shall be liable to 10 per "cent." And the practical application of this rule is explained by

Colonel Munro to his sub-collectors as follows—" Whatever may have " been the crop should it have been even less than the seed, the ryots " should always be made to pay the full rent, if they can, because good " and bad seasons being supposed to be equal in the long run, the loss " is merely temporary and the making of it good, is only applying to " the deficiency of a year of scarcity the funds which have arisen from " one of abundance." (Letter of Principal Collector—Ceded Districts to his assistants on remissions, appendix to 5th report page 769, para 5).

If this rule be not enforced, and the full rent for every field occupied during the year be not duly collected, it is manifest, that each field is *permanently* taxed only in name, and that the amount of the ryots' payment or the annual tax on the land, is regulated by the crops or returns to the ryot, and by his means at the time of demand. It is the same thing of course to the ryot whether the Government practically reduces his rental by striking off so much of the fixed tax on each field he has held, or by striking from the account, a portion of the field themselves, which he has occupied at a fixed assessment, the only point he can be anxious about, is that the demand upon him, should be limited annually to an amount which his annual produce will enable him to meet. The great, if not the only end then now answered by ryotwar, is to determine once for all a maximum payable by the ryot for the land he may have been induced to occupy, which shall save the necessity of an annual contract with him; and leave the revenue officer, the sole duty of extracting from him at the close of each year, the utmost he can pay even though the seed has not been returned.

That a demand and collection regulated by the out-turn of the year, has been, and I may add, must be the system in force, under a fixed money assessment on an average produce, might also, I think be demonstrated by an appeal to experience, as well as by the consideration of the peculiar circumstances already adverted to in the nature of the agriculture, and in the condition of the ryot. I would refer to the practice in ryotwar districts of granting remissions under various forms, and this, not as an extraordinary boon, but as a part of the system in practice whatever may be the theory, as one proof, that permanent ryotwar rents have never yet been realized. Again, the amount of balances of rents in ryotwar districts struck off as dead loss in the account general books. These enormous sums, further proving the absolute failure of the attempt to collect a fixed *invariable* annual rent in money from each field occupied. Finally, let the total revenue, or the full tax on all the land held for five years by the ryots at the beginning of each fusly, in ryotwar districts, and the amount

actually realized in the five years be calculated and compared, and it will be evident, I believe, that the system has been in districts assessed at the full rate of 33 and 45 per cent., not so much to consider the amount, for which the ryot may have engaged by his occupancy, as the rent to be collected from him, but, what he could actually afford to pay, with reference to the returns from his land in each year.

If the permanent money tax should, as in Coimbatore, have been fixed at, not more than 25 per cent. of the gross produce, with this peculiarly low assessment in its favour, the people will bear up under it for a long period, especially, when it has been also accompanied by remissions, and every species of indulgence to the ryot. So also, if one province, like Cuddapah has a comparatively rich soil, and an extraordinary proportion of rent-free lands, or, like Bellary, has been especially favoured by a general, and permanent deduction of 25 per cent. of the Government dues, whilst other provinces have not received a fraction; these provinces will of course comparatively flourish. But is it the ryotwar money rents, which produce this result? Or is it not solely in such districts the light assessment—and that, happily for the people and the permanent interests of Government, made lighter, by a departure from ryotwar, both in the remissions granted; and by the substitution for a settlement at the *commencement* of the year on the land held, and a fixed demand accordingly, a settlement towards its *close*, regulated by the season, and by the actual produce of the year.

The failure hitherto to do this fully, and the impolitic attempt to collect, as prescribed by theory, the full assessment annually, even in years when the seed has not been returned, combined with the forced cultivation of the soil, have been, I conceive the chief causes of the present depressed condition of the landholders. The demand which has been made upon them for years past in seasons of difficulty, has even, I fear, sapped the sources of future improvement and prosperity, by draining from them, their little capital, and preventing those accumulations, which can alone enable the ryot to profit by the peace, and security afforded by British rule. It is also to this severe pressure of late upon his resources in periods of difficulty, to which we must look, as the great proximate cause of the present decrease of the land revenue.

The evil of a fixed annual money rent, when persevered in for years, is not confined to district assessed at the full ryotwar rates, for when it does not, as in provinces lightly assessed, bankrupt the ryot, it manifests

itself in the diminution of substantial and wealthy ryots. The following table drawn from the accounts of thirty three villages in the Kangyam talook in the Coimbatore province will shew the effect of the system when combined with the practice of forced cultivation:—

Years.	Total numb of Ryots.	Ryots paying from 50 to 500 Rupees.	Ryots paying from 30 to 50 Rupees.	Ryots paying from 1 to 35 Rupees.
In 1801	1778	78 or 1 in 23	709 or nearly one half	971
In 1816	3449	34 or 1 in 100	1231 or about one third	2234
In 1831	5031	28 or 1 in 180	1396 or about one fourth	3607

The whole of the increase it is of importance to notice in the years from 1816 to 1831 is in the smaller holdings, and chiefly in the pauper tenements from 1 to 35 rupees—whilst the wealthy ryots, in lieu of increasing under our rule, have diminished in number from 78 to 28. A similar result after making the necessary allowance for the practice of wealthy ryots subdividing their lands nominally, by entering them in the names of their dependents, is exhibited in a statement from the Caroor talook. And personal enquiry, tended to establish the fact, that formerly a larger proportion of the occupants of the soil, were substantial ryots; whilst it is apparent that at present the great mass or more than three-fifths are in this favoured ryotwar district little better than pauper labourers, occupying for the most part tenements at a rent of trifling amount, which they pay with difficulty in seasons at all unfavourable.

Ryotwar authorities, are in the habit of ascribing this increase of small, or, pauper proprietors, to the usages of the people alone, especially to their law of inheritance. They do not appear sufficiently to advert to the fact, that the same law and usages have existed for ages, and that this sudden, and rapid augmentation of small proprietors within the last twenty years, cannot well therefore be the result of a long prevalent usage, but must have its origin in some more immediate cause. The augmentation is no doubt, in part, the effect of the greater security of property and person under British dominion; but there is little reason also to doubt, that it must chiefly be ascribed to the revenue system in force.

The extreme subdivision of property, and the rise of this large class of pauper landholders, have also been advocated as beneficial to the

country by some ryotwar authorities who have kept out of sight the momentous consideration, that the return from land held by this class, is full one third less, than if cultivated by a proprietor of substance, who could afford to dress it properly; and that the permanent effects of a system which brings the mass of the land into the hands of the poorer classes, is, to place the country under a sentence of comparative sterility, covered like Ireland with pauper occupants, without capital to meet any reverse, or surplus to undertake any improvement; and unable to command those comforts and conveniences of life, which would gradually raise them in the scale of society, and advance the country in civilization and wealth.

Before closing these remarks, I would notice briefly two other evils inherent in fixed money rents. All fields permanently classed and assessed as wet or garden land (*Nunjah* or *Bhagayet*) must continue always such, in order to give the higher permanent tax. The conversion therefore of wet or garden into dry grain land according to the varying demand of the market, is prohibited by the system itself. And though the demand for garden or wet produce in a district, may fall off 50 per cent. or more, and prices may sink, to an extent to make such produce an unprofitable crop at the wet, or garden rate of tax, compared with dry grain, yet the ryot has no option, he must still sow this land with rice, &c., for that alone will yield in money the higher rate of assessment.

Again no adequate provision is made, except in the putcut ryotwar of Coimbatore, for fallows, and for the exhaustion of the soil, the certain consequence of the continual cropping rendered necessary to enable the ryot to meet the invariable annual Government demand. Of the evil effects of this omission, the following instance was brought to my notice. The *Bhagayet* of a ryot, then a flourishing and productive property, had been classed and permanently assessed in 1802. But in the long period intervening, the soil had become exhausted, and did not return any thing like an average crop. Still the proprietor was called upon to pay for it, the same full *Bhagayet* tax, as when first assessed. At the date it was examined (1832), the land was so exhausted by continual heavy cropping, as scarcely to repay the charges of cultivation, and for some years previously it had of course been deteriorating, whilst throughout the whole period of this deterioration from natural causes, the full rent had been demanded, and paid. The means of the holder were necessarily therefore annually impaired, till he became unable to bear the tax; and nothing but ample remissions, not

for one or two years; but for a term could save him from ruin. Yet revenue authorities strictly following out the principles of ryotwar, and not sufficiently bearing in mind the peculiar physical circumstances of the agriculture of the country, and the present condition of the people, denounce all remissions, as incompatible with sound revenue management. Whilst it would appear almost self-evident, that so long as produce, and prices annually fluctuate very largely, and droughts are constantly recurring; so long an unvarying annual money tax on each field, cannot be imposed upon a small proprietor without his *utter ruin.* And further, that so long as the bulk of the landholders remain, what they now are, proprietors of petty tenements, and without capital, the principle of a fixed *annual* money rent, which leads inevitably to an extreme pressure on the ryot in adverse seasons, is not a sound and practically wise system.

Assuming such to be the case; and both experience, and theory would seem to confirm it, I would suggest for consideration some modifications of the existing revenue system, which would I believe greatly relieve the agriculture of the country from its present depression—and gradually convert the ryots into a body of wealthy landholders—without trenching largely on the Government revenue. To avoid misapprehension, I would here remark, that it is not ryotwar, *as a mode of collection*, of which it is the chief feature, that there shall be no middle man, between the Government and the occupant of the soil, of which I should propose a modification. For under the present circumstances of South India, and in the general ignorance of all classes of the people, I do not think there is any class, whether zemindar, mootadar, or the heads of the village community, to which the well-being of the ryot can be so safely entrusted, as to the European officers of Government; and I should regret to see this important feature of the Madras revenue administration touched. But looking to ryotwar as a mode of *assessment* on the land, containing as its leading principle, the imposition of an unalterable money-rent on each field, payable annually, under all circumstances of season and of price,—it is to this, I object, and would raise the question whether it is not highly injurious to the ryot in the long run, whatever may be its temporary advantages.

In considering the modifications required to adapt the revenue system fully to the country, I take it for granted, that it is not in the power of the Madras Government to relinquish any large portion of the revenue at present raised directly from the land; and consequently that the Government is not prepared for that great practical measure of relief,

which might render every other measure unnecessary, of reducing the rate of tax on all land occupied, and not irrigated by Government works, to the ordinary poonjah or dry grain rate, and thus yielding to the ryot for ever the entire benefit of all improvements on his land. The plan proposed, proceeds therefore upon the supposition of giving up as little as practicable of the present amount of land revenue; and of leaving waste, and other sources of future income from the land open.

I would suggest first, as better suited to the circumstances of the country a permanent assessment on each field in grain, commutable into *variable* money payments, in lieu of the permanent tax in money now assessed. The commutation to be made periodically with ample allowance for unfavourable years.

The basis of the system, would therefore be a fixed corn or produce rent, as a maximum rent, commutable into a money payment, regulated by, and varying periodically with the actual state of prices.

An assessment varying from time to time with prices, in lieu of the permanent money tax of ryotwar, appears to be required; not only because prices are found by experience to be subject to very great alternations, but because money itself alters in value, and the land-tax of a fixed amount of money, which may at one time be light and equitable, may become by changes in the value of the currency oppressive, and intolerable. But it is chiefly necessary, because the amount of the tax on the land is so large, and the capital of the ryot so limited, that a very trifling alteration in price, is of vast moment to him; and because, the excess in this country both of agricultural population and capital, over non-agricultural (which from the influence of caste must continue) is such, as of itself to induce a constant tendency to an overstocked grain-market, and consequently to depreciation of price. Any *permanent* money tax, founded on an average of prices drawn from the state of the markets during previous years, will therefore, in the long run, prove injurious to the landholders. And it will be found, I believe, essential to the prosperity of the ryot of South India, when his rent is received in specie, that the money tax on each field unless extraordinarily low, should not be permanently fixed, but that a review of the state of prices should take place at short intervals, and the Government demand be adjusted accordingly.

A fixed moderate average corn or produce assessment, which shall be the maximum of the Government demand, would also hold out to the proprietor, or occupant, the strongest inducement to improve his land, as it will effectually secure to him, the *whole* increase arising from better cultivation, or from capital sunk in improvements. This can never

be attained by *a fixed money* rent on each field, at *the present rates*, for every considerable fall in price, an event of frequent occurrence, must disturb the calculations of the ryot, and destroy all certainty of profit from such outlays under that system. But, if he has to take into his consideration, only the fluctuations of produce, he can estimate his prospect of success with more accuracy, and he is secured against one source of failure. This, it is obvious, must lead to a more frequent, and successful investment of capital in improvements, so important both to the individual and general welfare.

These two points—a fixed maximum assessment of grain or produce on each field, and a fair commutation price varying periodically with the market, being established, I would further engage on the part of Government, that in years of drought, when the produce might fall short 20 or 25 per cent., or upwards of the average, taken as the basis of the assessment, that the deficiency beyond that, should be borne in part if not wholly by Government. For instance, if the ordinary *average* produce of the cawney be rated at 100 measures, and the rent be fixed accordingly, and the actual crop in any year, shall be reported by the collector to have fallen to 75 measures, or less, a general, and well defined remission of tax, according to the extent of the decrease in produce, should be authorized.

And further, in years of excessive drought and total failure, when the land has made no return, not even the seed, that there should be a postponement of demand, or an entire relinquishment of the Government dues on such land. This I am satisfied will prove the only wise course at such periods. For it is certain, that the suffering inhabitants will find sufficient employment for any surplus funds which they may possess, in meeting the high prices of famine. And it will be the better policy, as well as a moral duty to leave to them the full extent of their resources, to bear up against the visitation, and to provide some small surplus, to commence anew, when the pressure shall be past.

As a compensation to Government, and to enable its treasury to meet the defalcations of calamitous seasons, I would adopt the rule, that in all years of high price, combined with an average produce, or one above it, when the profits of the cultivator must be certain and large, that after a limit say 10 or 15 per cent. advance in price, the Government should participate, and receive a proportionate increase of revenue, an addition of 5, 10 or more per cent., according to the extent of the rise in price. This would of course prevent, as all taxation on the land must, the rapid augmentation of the national wealth. It must make its progress more slow; but it would not be found greatly to retard improvement.

It should be considered as an extra demand, to be regulated at the lowest scale compatible with the exigencies of the state, and it would be found when tried by the test of general principles, the best *present* available source of revenue. For the extra tax would be imposed, only, when the surplus wealth of the people is largest, and not like the permanent tax of ryotwar, often when their means are lowest; and one of its chief effects would probably be, to divert into the coffers of the state a portion of the sums now wasted on marriage festivals, and in similar occasions of large personal expenditure; for it is in that mode, that the extra gains of profitable years in lieu of being husbanded, are at present expended by the ryot.

The system here proposed is in force in its leading features, in several of the best managed properties in Scotland and England, and a reference to the evidence annexed to the last Report of the Committee on Agriculture of the House of Commons (1836) will shew its beneficial effects. Its first principles, a corn rent with a fluctuating commutation price within a defined limit, are contained also in the *Co'oongoo* system of Tanjore, introduced nearly 15 years' back, which has been, and still is in operation throughout a large portion of that province. It could not meet therefore with any serious difficulties in practice, indeed the ryotwar, as it is termed, of Tanjore, recently introduced, also contains some of its essential elements; and it is in favour of the plan, that the merasidars of that province, who are without doubt competent judges of what is necessary for their permanent interest, have rejected a fixed annual money rent, and required a modification of the ryotwar tax of the nature here suggested, in order to meet the necessities of unfavourable years.

The chief objection which would attach to the plan, is the obvious evil of the occasional changes of settlement required, in order to adjust the commutation price. To obviate this objection, we might take as our guide, an average of only the low, or medium prices of the previous seven or ten years, and fix the standard price at this rate. Owing to the circumstances repeatedly adverted to, particularly the large excess of the agricultural population over all other classes, which make low prices the general rule, and high price the exception in this country, the Government would lose but little, in excluding from the commutation average, years of high price, and two most important advantages would be gained.

The ryot, or merasidar would be secured against over demand; and it would not be necessary to interfere with him frequently, for it would probably be found, that the rent fixed on a commutation taken at this

low average, might safely go on for seven or ten years together, and new engagements would not be called for oftener under this system, than once in ten years.

The advantages which the proposed plan would possess, over the present system, are.—First, that it unites the benefits which result to Government from an assessment in money, with those which the ryot enjoys from an assessment in kind. That it does not like the ryotwar require from a people wholly unprepared for it, the duty of a forethought foreign to their habits, nor throw upon them the burthen, to which they are unequal, of all fluctuations of prices, as well as of periodical drought, and of alterations in the value of money.

Secondly, it provides more effectually for the profitable outlay of capital in the improvement of the land, by establishing a better defined and more certain Government demand, a maximum rent not liable to fluctuation.

Thirdly, it secures the landholder, equally with the immemorial division of the crop, from the ruin, and total bankruptcy, which seasons of excessive drought must bring with them, when he is, as at present, required to yield at such times to Government, the 33 or 45 per cent. of a produce, of which he has never reaped ten, nor possibly one per cent.

The Government revenues would also suffer, but little in the course of years, as the treasury would be filled by the extra levy, in years of average crops and high prices, and by the more regular payments in-ordinary years, the consequence of a more equable demand. The cases of failure also would necessarily be few, when the Government itself shall provide against the larger fluctuations, and when the system in force, shall not call for the exercise of a providence which will not be found amongst the ryots for generations to come; and which were it now the national characteristic, would not avail the ryot under the existing high rate of tax on the land, joined with the extreme subdivision of property growing out of present usages. Both these causes precluding the accumulation of capital in the hands of the landholders, which might enable them to meet the heavy Government demand in unfavourable seasons.

It may be observed finally, that, if this substitution of a commutable corn or produce rent, for a fixed money rent, has been found of late years, from the great fluctuations in price alone, expedient even in England, where the farmers and holders of land compared with the South Indian ryots, are persons of large capital and extensive credit; and where also, produce and prices never fluctuate to such wide extremes. It would appear to be still more required in South India,

and it can scarcely be doubted, that it would be found better adapted to the wants and character of the agriculturist, and to the peculiar circumstances of society around him, than a system, like ryotwar, which demands the same annual money tax invariably, admitting in theory of no remissions, and having in practice none adequate to the heavy losses of unfavourable years either of produce or price.

On a Redemption of the Land Tax.—In concluding these Notes I would throw out for consideration, as a measure practicable, under the existing, or any system of revenue administration—the expediency of conceding to the landholder the privilege of redeeming the land tax for lives, or for a term of years.

A provision of this nature, would, it is probable give an important impulse to agriculture ; and without it, it is I fear hopeless to expect any decided improvement at an early date. For if the land is to bear an annual heavy assessment, it follows, almost as a necessary consequence, that every proprietor will continue from year to year, the old routine of cultivation, in order to ensure the amount of his tax. But were his land wholly free from tax, for a term, he might, and would be disposed to speculate in raising new and more valuable products, the returns from which must in the first instance be uncertain. And when we consider that it is not often, in consequence of the great subdivision of property by law, that agricultural capital accumulates in one hand, in this country, it is of the more importance, to open such a field as the redemption of the land-tax would do, to induce its employment on the land.

It is almost certain, that the late efforts of Government to engage the ryot in the cultivation of tobacco, senna, sugar, &c., must fail of any practical utility, unless a measure of this character is at the same time adopted; which shall enable him to undertake the cultivation of such products without the risk, which now attends the attempt, of not having wherewith to meet his annual tax ; and with no adequate security also, that if successful, a heavier assessment will not be the early if not the immediate consequence.

The redemption of his land tax would, at the same time free the ryots or merasidars, from the constant interference of the revenue officer, and would lead to improvements from which they are now deterred by the knowledge, that the public officer can, and will interpose whenever any change is made. It is also by this means that they will be enabled gradually to rise above the tutelage and influence of the tahsildar, from whose interference they now often suffer. Whilst under a re-

demption of the tax, the ryots would partially escape the evil of the successive revenue experiments which must continue to be made, till the land is in the hands of proprietors, equal in intelligence with their rulers.

There can be little doubt also, that the measure would give much greater stability to the revenues of the country. For the redemption, in other terms a payment in advance on an equitable adjustment of the Government demand, excludes the possibility of remission; and the possession by the ryot of a portion of his land in all seasons rent-free (the tax being already paid) must give facilities to the punctual realization of the annual revenue.

It would at the same time, it is probable, be found to operate beneficially on native habits. As the prospect of freeing his land for a term from its burdens, would hold out a great inducement to the ryot to expend his accumulated savings on his land and he would inevitably be tempted to turn off a part of his present wasteful expenditure on marriage occasions, &c. into this more profitable channel.

I am not aware that any evil could result from according this privilege to the land-owners, if it were confined, as it should be in the first instance to a term of 15 or 20 years, renewable at the option of the owner, for 10 or 15 more, on the payment of a limited fine or premium. It would then, I think, work well for the country without diminishing the Government revenue. It has been adopted on a much more extensive scale than here proposed in Ceylon, and if applicable to the state of society, and the tenures of land there, it can scarcely be found inapplicable to the neighbouring provinces on the contiment, in a great measure similarly circumstanced.

On the Interference of Government in periods of Famine.

The entire failure periodically of all return from the land, and the improvidence and poverty of the great mass of the ryots, which have been adverted to as incidents in the agriculture, and in the state of society, peculiarly affecting the question of permanent money rents in this country, apply, I conceive, equally to another question, scarcely less important—the duty, and policy of the Government in seasons of severe dearth or famine.

The doctrine now promulgated on this subject, is professedly based upon the principles of political economy, and drawn from Adam Smith's

work (Book iv. ch. 5. Digression on the Corn Trade and Corn Laws), but rather I must think from the letter, than from the spirit of that enlightened work. The circular orders of Government* which embody Dr. Smith's arguments, overlook apparently the important consideration, that his views are mainly, if not wholly grounded upon the circumstances of agriculture, and society in Europe alone, and even in Great Britain; and that in the very few remarks he makes in reference to famine in India, his premises are incorrect, and his conclusions necessarily therefore of little weight.

Dr. Smith first states as an historical fact, that, in Europe, owing to the variety of soil, and the nature of the climate, "*the grain lost in* "*one part of the country is in some measure compensated by what is* "*gained in another, and that a famine has never arisen from the fault* "*of the season, nor from any other cause than the violence of the* "*Government attempting by improper means to remedy the inconvenience* "*of dearth.*" In this statement, so far as Europe is concerned, we may fully concur. But when he goes on to assume, that "even in rice "countries, the drought is perhaps never so universal as necessarily to "occasion (of itself) a famine," and *that famine has always been induced in India, by the acts of the Government* we must, with our more enlarged experience of the nature of tropical droughts, withhold our assent. For we well know from bitter experience, that although the Government of India for years past, has most rigidly abstained in seasons of scarcity from all interference,—the most intense and deso-

* *Circular Orders, 30th January* 1833. "The Right Honorable the Governor in Council requests, that you will take every suitable opportunity of explaining to the Judicial Officers, with the desire that they will inculcate the same upon the native servants, that in a time of scarcity, high prices must obviously constitute the best security against the calamities of famine. When there is a deficiency of the necessaries of life in any country, the only method of counteracting the evils resulting from it, is to diminish, as much as possible, their consumption. This is effected by high prices better than any other measure, for as every poor man is compelled to contract his wants to the smallest quantity of food that can support him, it is plain that a larger number of families are thus enabled to subsist upon a diminished supply whereas the interference of Government in such emergencies either by fixing a maximum of price, *or by throwing a quantity of grain into places which would not receive it in ordinary course of mercantile speculation,* disturbs the natural current, by which, where trade is free, the demand of any commodity is sure to meet, as far as circumstances will allow, with a corresponding supply, and has a tendency (which it is to be feared has too often been realized amongst the native states) to convert a season of scarcity into one of absolute famine.

The Right Honorable the Governor in Council considers it highly desirable that the natives in the provinces should be made acquainted with the sentiments of Government on this important subject, and be apprized of the calamitous results which would inevitably follow any other line of policy."

lating famines have nevertheless prevailed. And it is open to every day's observation, that the drought in whole provinces, contrary to Dr. Smith's assertion, is ordinarily universal: the failure which affects one field, affecting all. And further, that in South India, and we might add in tropical countries generally—there is not that variety of soil or climate, which can compensate the failure of the periodical rains.

If we cannot premise then of India, as we can of Europe, that famine "never arises from the fault of the season alone," Dr. Smith's principles, and his whole reasoning fail of application to this country, and the orders of Government based upon them, rest consequently on no solid foundation.

The Government orders appear also erroneous, in applying without limitation to the grain trade of South India, the great general principle established by Smith, that, "where trade is free the demand for any "commodity, is sure to meet as far as circumstances will allow, with a "corresponding supply." In applying this principle to trade in the food of a country, we shall err, if we omit to take into our consideration the striking peculiarity of the corn trade, *that it admits of no delay in its supplies.* The supplies of grain must arrive at the precise moment they are required, or they are useless, the evil has been done, the consumers themselves have been cut off. The truth of Dr. Smith's general principle no one will be disposed to question, as respects trade in general, and even the grain trade in seasons of scarcity in Europe, for the reason he repeatedly assigns, that the energy and enterprize of the British or European merchant in pursuance of his own interest, will always supply the market *more readily*, as well as more cheaply than Government agency: and it follows as a necessary consequence, that if the Government interfere in the corn trade in Europe in a period of dearth, and the private trader withdraw, the requisite supplies will be provided more *tardily*, and at a greater cost, and a dearth or a temporary famine will ensue.

We know well that in periods of scarcity in England, when large profits are to be realized by the importation of grain, the British merchant, be his ordinary traffic what it may, immediately turns aside from it, and invests his capital in grain—and such is the extent of his credit, that he can augment his capital almost at will, and before his bills at 60 or 70 days' sight are due, he has brought his cargoes from the Baltic, and other continental corn markets, and disposed of them to the inland dealer.

How differently circumstanced is the grain trade in South India. The whole trade is shackled by the trammels of caste, and of usage, which

confine it in a great measure to a limited number; and the native merchants of the Madras Presidency have little of the energy and enterprize, which characterize the European trader, and which could fit them for the task of meeting the emergency of a famine demand. To such a degree is this inertness carried, that rice may be selling at Madras at double its ordinary value, and be comparatively a drug in Tanjore, yet neither the merchant, nor the native craft-owner would think of attempting to bring up a single bag by sea, till the monsoon was favourable. And the whole coasting traffic of the presidency, so far as the native merchant is concerned, is at this hour regulated, not by the varying demands of the market, as by the monsoon—I might ask, what application has the reasoning of Smith to a trade so circumstanced?

As an instance of the manner in which native maritime traffic is carried on at this hour, I may mention the fact, that the master of a vessel leaving the port of Nagore with a cargo for the Eastward, on meeting with an adverse wind even within 24 or 48 hours sail of Penang, now immediately tacks, returns leisurely to Nagore, puts his vessel into dock, lands all the cargo, and patiently abides the favourable season of the following year, before he again attempts to take his cargo to its market.—This, and similar facts, furnished to me not as special cases, but as samples of the ordinary routine, afford sufficient proof of the present infant state of native commerce, and they are of great importance in their bearing upon the grain trade. For they go far, I conceive, to prove, that in this trade at least, where supplies cannot be waited for many days, it is not correct to assume as an established principle, as the government orders do, that the demand in the trade in South India always meets at the hands of the native trader with as full a supply as circumstances admit.

But the grain trade in this country, has not only to struggle against the want of energy, and enterprize of the small body of dealers to whom it is by usage confined: but even if they had the necessary enterprize, I would enquire, where, in the emergency of famine, are they to find the extra capital which shall enable them to purchase, and bring to market the requisite supplies at the high prices of dearth? Let us suppose that the average supply of rice for Madras is 10,000 garces in the year, and the capital required, when grain sells at its ordinary rate, 20 lakhs of rupees.—Owing to the scarcity, price rises 100 per cent, and the demand, in consequence of the more frugal consumption caused by high price, falls off 20 to 30 per cent—still large extra funds are required in the trade in order to bring the reduced supply to market *in due time.*—Where can the grain merchants now procure this additional capital. Their credit is not of that character, that private capitalists would advance largely,

even if capital was forthcoming, and as abundant in India as it is in England, which it is not. Unless then the Government afford its aid, by opening its treasury, and making large advances, how is the necessary supply of grain to be brought into the market *in time* to remove the scarcity, by the instrumentality of the native dealer alone?

Every successive dearth has demonstrated to us hitherto his inability; for in no district, has there hitherto been a timely importation, sufficient to avert famine. This, which I believe to be a well established fact, furnishes in itself a strong a priori argument against the correctness of the view of Government. As does also the fact, that although the trade is under British rule perfectly free, rice sells in seasons of scarcity in one district at eight or ten measures the rupee, and in another almost adjoining, at half that cost. Another proof, that supply, and demand do not now in practice, readily adjust themselves.—And there is I apprehend but one explanation to be given of this circumstance—that there is neither enterprize, nor capital in the corn trade at present, adequate to meet the large, and extraordinary demands of the market in districts where famine prevails.

The peculiar circumstances of dearth in this country, afford also additional arguments, against the views contained in the Government orders, and point to the necessity of the interference of the State. *The magnitude of the evil*—entire districts being involved in suffering at the same moment—*its extreme pressure* on the population—destroying even thousands in a few weeks—with the well known *limited means of* the native merchants, and their general inability, to undertake extensive speculations in distant markets,—all preclude the hope, that private exertion will be found sufficient to meet so great an emergency. We have strong confirmation of this, in the circumstances of the recent famine in this presidency in 1832-3. Rice was at that period abundant and comparatively cheap in Canara, Malabar, and elsewhere in our own provinces, when the famine was at its height in Guntoor; and yet, no supplies reached that province, in time to prevent its almost entire desolation.

Facts of this nature appear to me to demonstrate the duty of interference. And that it is not enough for the Government to offer the people work, and pay them for their labour, when the crisis of famine has arrived—trusting to the native traders' unassisted energies to provide the requisite supplies to meet the urgent demand for food—but they must, by a prudent foresight, and by their own energy, bring the abundance, and the stores of distant and foreign markets within the timely reach of the retail trade, or the pressure of famine will remain in full force, till the population is brought down to the level of the numbers, which the native trader can supply.

If these views are borne out by experience, they lead us to an inference wholly opposed to that assumed in the Government Orders; and in lieu of concurring in the opinion,—that "if the Government were "to throw a quantity of grain into places, which would not receive "it in the ordinary course of mercantile speculation, the only effect "of this measure, would be to convert a scarcity into a famine," I should almost be disposed to assert the reverse, and to maintain,—that at present in South India, whilst its corn trade, and trade in general are at so low an ebb, the timely and judicious interference of Government, instead of aggravating, is the only mode in general, by which scarcity can now be greatly mitigated and famine prevented. And that an importation of grain, through the means of Government capital, and possibly of Government agency, *from foreign or distant markets*, where there is abundance, into districts suffering from dearth, may be under the existing circumstances of the country a measure of sound policy; and the best, if not the only practical method by which the distress caused by the peculiar character of tropical droughts can be greatly alleviated.

It is no argument against an interference of this nature, to cite to us, as the orders of Government do, the fact, that native rulers in former times, participating in the ignorance, and in the prejudices of the people, have converted scarcities into famines, by the barbarous policy of compulsory sales, or other arbitrary interference with the capital, or with individuals in the trade. There can be no question now, as to the proper course to be pursued on this head: for Dr. Smith has placed beyond dispute the important principle, that the interest of the inland dealer and the public is the same, and the more free he remains, the better.

No interference with this branch of the trade is for a moment advocated: for if adequately supplied, the home-dealers it is certain, are fully equal to the due distribution of all the grain brought into a district in a year of famine, in as much as they distribute the larger supplies of abundant years. But it is in the importation—the foreign or whole-sale trade, that we would propose the interposition of Government. Not by any restriction on the wholesale merchant, or the importer, but by offering to him the assistance of Government; and by endeavouring to infuse into the import and wholesale trade a spirit of adventure and activity, adequate to meet the urgent and large demand of famine. And should this, after full trial, fail to place the necessary supplies in due season, at the doors of the retail dealers—then only by leaving the wholesale merchant to himself, and making use of a Govern-

ment agency for introducing for sale into famine districts only, timely supplies from distant and foreign markets, at the risk of Government; whilst the home, or the local trade should be left altogether to take its own course, and purchase large or small supplies as it might see fit.

The mode in which the interference of Government could best be effected, experience can alone determine. But on general principles, it would appear right to interpose in the first instance, by throwing Government capital into the existing grain trade, in the form of advances to native merchants, and others, who might be willing to import grain at their own risk, into districts threatened with, or suffering from dearth. This assistance has an advantage over the principle of a bounty as it furnishes the capital by which the supplies are to be obtained, and might readily be afforded, by authorizing Collectors to grant pro tempore, bills at favourable rates on the treasuries in those provinces, in which grain was abundant and cheap. To this should be added bounties on importation; and it might be also highly desirable for the Government to offer to the native trader peculiar facilities, either Government vessels or land carriage, for the safe transport of his grain to the districts where famine existed—that no impediment might arise to the introduction of his supplies, from the want of carriage, or from the fear of violence from a suffering population.

If these means failed, and it shall be found, that the native trader is not equal to the task of providing the extra supplies needed in seasons of famine, and that neither his credit, nor any securities he could offer, are such, as could warrant large Government advances to him,—then it would be no departure from sound principles, to employ a Government agency—for procuring grain from distant markets. The present course sanctioned by Government, by which its treasury is open to its Commissariat, to purchase up in one hour from the wholesale dealer, the entire stocks actually in the home market; whilst the retail trader is left, either without any supply, or to seek it from a distance, is now a practical interference of the worst kind, one which must greatly aggravate the distress. At Nagpore in 1833, it is reported to have instantly converted scarcity into an absolute famine—and it is not easy to conceive it to be a wise course even in a financial point of view. For the same supply, procured in the distant market, where grain had not reached famine prices, would it is probable cost less even with the carriage, than when purchased at scarcity prices. Instead of the present practice, I should be inclined to suggest, even though it might occasion loss to Government, that in seasons of great dearth, the Commissariat should be prohibited from

purchasing grain in the markets of those districts, in which famine prevailed; and that it should be required to import its supplies from places, where grain was comparatively abundant. By this means, the stocks of the district would be left available to the retail trader; and it is more than probable, that as the scarcity increased in severity, the Commissariat might be made instrumental in supplying from its stores the local market with *foreign* grain, at a cost, which should cover all expense of carriage, and yet greatly mitigate, if not prevent famine. I will not however pursue this subject—the object of these remarks is not so much to advocate particular measures of relief. But rather to induce a full examination of the doctrine laid down in the Government orders; and to endeavour to ascertain, whether it be an indisputable truth to be taught to all our native servants, that injury must invariably result from any interference of Government in seasons of dearth in this country. And to lead to the important enquiry, whether there are not, as Dr. Smith seems from his guarded language to admit, means open to the Government, which may not be improper for it to adopt in periods of drought, by which that most dreadful scourge, the absolute famines which now periodically desolate our provinces may be wholly prevented, and scarcity at all times greatly mitigated, without a departure from sound general principles, and at no great charge on the finances of the State.

III.—*On Improving Internal Communication in the Carnatic.*— *By* J. Kellie, Esq., *Assistant Surgeon.*

The expence of transport of goods from Madras to Trichinopoly, 220 *miles, is about* 35 *rupees, or* £3 10*s. per ton, which is nearly as much as the present price of freight from Madras to London.*—Captain Cotton's *Report.*

With the view of facilitating intercourse and giving a spur to commercial enterprize, it was some time ago in contemplation to construct an iron railroad betwixt Madras, and the large towns of Conjevaram and Wallajanuggur.

That the project was a most enlightened one, and would fully have sustained many of the expectations of its original projectors, all, who have regarded with attention the amazing benefits derived from similar undertakings in other parts of the world, must confidently have expected, and every one who takes an interest in the progress of civilization in

this our adopted country must regret, that any obstacle should have interfered with the execution of a measure pregnant with such numerous advantages to society. For, putting aside the more obvious and immediate benefits which would have been derived from such an establishment; no measure, with the exception of the diffusion of the English language, would conduce so much to diminish the immense space which exists between the inhabitants of India, and the European, and to inspire a general national feeling throughout the country, as facilitating intercourse betwixt cities and the towns in the provinces; the novelty and cheapness of regular and rapid communication, would induce numbers of inhabitants, who under other circumstances would have remained stationary, to leave their homes, and flock to the capital, "where the competition that takes place, the excitement that is constantly kept up, the collision of so many minds brought into immediate contact, endeavouring to outstrip each other in their respective departments, developes all the resources of the human mind, and renders a great city a perpetual radiating focus of invention and intelligence." *

The belief that principles of economy alone, and the little prospect of a direct remuneration commensurate with the great outlay of capital requisite for such an undertaking, influenced the members of Government in not giving their support, convinced although they must have been of the advantages which would flow from it—has induced me to address you, and to advocate a plan, by which all the great objects of such an establishment may be secured at a comparatively trifling expence, and at the same time is free from the numerous objections which in my opinion are necessarily attendant on iron railroads in India.

Iron railroads are constructed and maintained at an enormous expence, and are only suited to a country abounding in wealth, and which has arrived at so high a state of civilization as to render time a most valuable consideration and cause celerity of intercourse to be estimated beyond all price, and even then will only be attended by success if supported by a large influx of passengers, able and willing to pay for these advantages. For, it must ever be borne in mind that it is still a matter of opinion how far heavy goods can be conveyed along railroads with advantages to the proprietors, and that the great success of those established in England has arisen *entirely* from the conveyance of passengers.

In my opinion, which however I offer with great diffidence, iron railroads are not adapted to India, either as regards the present condition

* M'Culloch.

of the country—the genius of its inhabitants, or the stage of civilization at which they have arrived. India is essentially an agricultural country—but carrying on a considerable traffic between the coast and the interior, and which is in a state of great depression from the impediments to free intercourse; nothing therefore will conduce so effectually to raise it from its low estate as a cheaper mode of conveyance for its merchandise and raw produce. That expensive iron railroads would effect that change is more than problematical.

The saving of time is in the estimation of the natives of India a matter of very little importance, and strong indeed must be the prospect of gain, and small the fare to induce them to leave their present dilatory proceedings and various occupations to avail themselves of this new means of intercourse. Thus the main source of revenue in England, the conveyance of passengers, will, from the indolence and poverty of the great body of the inhabitants, form an unimportant item in the returns of an Indian railroad. There are other objections to their general introduction of no small magnitude.

1st. They would require to be laid down upon an entirely new line of road.

2ndly. An engineer who has directed his attention especially to this department could alone superintend the construction of iron railroads, and he would require to have a large body of iron workers to assist him in making, and repairing the rails, carriages, &c.

3rdly. No carriages but those of a peculiar construction could be used upon iron railways.

4thly. An efficient police establishment would be requisite along the whole line of road to protect such valuable property, and to prevent the rails being injured or the road obstructed.

5thly. By such a means of conveyance, there is immediate collision with the interests and prejudices of a large body of the natives, now employed as carriers, by entirely removing the means of transport from their hands.

6thly. The expence of maintenance. This item alone in the accounts of the Liverpool and Manchester railroad for blocks, "sleepers," "chairs" &c. amounts to more than £400 per mile!

Instead therefore of using bars of iron in the formation of the "way," it is proposed to substitute slabs of granite, each slab about 5 feet long and 1½ in breadth and thickness. These, if laid down perfectly level and having their upper surface even with the road, in parallel rows, and at such a distance apart that the wheels of the common cart will run in the centre of each row, will form a road possessing nearly

all the advantages of an iron railway, and constitute the one now recommended.

Ways of the above description, or tram-ways, as they are usually called, have been constructed in Italy of blocks of lava, and at Marseilles of granite, and the waggon road laid down by the East India Company, betwixt their docks and warehouses, is constructed of the same materials and upon the same principle.

It is unnecessary to remark, that the superiority of iron railways over turnpike roads arises solely from their being perfectly level, and smooth, and from their admitting of carriages being so adjusted, as to allow of their being propelled forward with great velocity by means of steam or horse* power, without the chance of escape: now it will at once be obvious, that a granite way gives all that is required in the first instance, and, as the *very rapid* conveyance of either goods or passengers ought not to be so much the object in this country, as the formation of a smooth, level way, composed of a solid material, and requiring little repair, admitting of the easy passage of carriages, and the consequent great saving of animal labour, the fixing of the carriage on the rail becomes a matter of very secondary importance; indeed, without that arrangement, it secures all the advantages of an iron railroad, *on which the carriages are dragged by horse power*, as no difficulty could be experienced in guiding a horse betwixt, or two bullocks along the two broad level strips of granite forming the road; and I presume the most sanguine in improvements can hardly anticipate the time when steam power will be used in India for that purpose!†

On the other hand, tram-ways would not originally cost so much as iron railways, *even when constructed under the most favourable circumstances;* they would require but little superintendence, and could be repaired when necessary by the common workmen of every village. They could with facility be constructed over the Carnatic on the roads at present in use, and, would offer no obstruction to the general traffic of the country, as they might be crossed and recrossed by native bandies without inconvenience or injury. Being adapted for carriages of every description, they would not abruptly interfere with the customs of the natives, and would, if they were so inclined, leave the transport of goods in their own hands—but, with this manifest advantage, that their oxen

* On the Edinburgh and Dalkeith railroad the carriages are dragged by horse power at the rate of 10 miles an hour.

† The original cost of a locomotive engine is about £800, and the repairs calculated at £1500 per annum!—Lardner on the Steam Engine.

would be able to drag a much heavier load. The accompanying figures and extract from Gordon on Loco-motion will shew at a glance the advantages which this description of way possesses over iron railroads:—

	Iron rail-road.	Granite tram-way.	Broken stone-road.
Tractive power required to move one ton on a level ...	10-lb.	$12\frac{5}{10}$ lb.	43-lbs.
Annual maintenance per mile....................	£400	£5	£133

"Upon this road (the Commercial-Road tram-way to the E. I. Docks) Mr. Walker found, that one powerful horse was able to draw $30\frac{1}{2}$ tons, upon a level, at the speed of four miles per hour; but the exertion of the horse was too great to be continued for any considerable time; and hence this must not form a basis for calculation. Mr. Walker has however shown, that upon a level, ten tons gross may be considered a proper load for a draught horse."—"The facility of turning off and on such a road, and of crossing it, the advantage being unconfined to any one species of carriage, or branch of trade,—being open to all,—being $\frac{9}{10}$ths cheaper in construction than any railway,—and costing for annual maintenance less than $1\frac{1}{4}$ per cent of the acknowledged sum required to maintain the Liverpool and Manchester railway, compensate amply for the mere difference of tractive power."

I have thus endeavoured, however imperfectly, to point out the comparative value—the advantages and disadvantages of these two descriptions of "roads." The one in my opinion combining in its formation cheapness, simplicity, and efficiency, proportioned to the present state of society in India, the other, complicated in its construction, enormously expensive, and immediately interfering with the prejudices and interests of a large portion of the inhabitants. Iron railroads are undoubtedly the most scientific means of transport yet known or probably that can be devised, but their great cost &c. is a bar to their introduction in India. Tram-ways stand next in importance, and may be used with advantage when the poverty of a country or small traffic will not justify the construction of an iron railroad.

However, the superiority, and the advantages which would flow from such a means of communication could only be fully developed, and

demonstrated to the inhabitants, by the establishment of a regular and a speedy system of conveyance upon them. If we rest satisfied by placing at the command of the natives such an improved means of intercourse, and content ourselves, by simply levying a toll on all carriages which take advantage of it, no one will doubt but that the grand objects of such an undertaking would not be obtained, that few of the evils which press so heavily on the internal transport of the country would be removed, and the civilizing influence of the measure would be entirely defeated.

The advantages of such an establishment can only be worked out by European energy and European talent, by men who are convinced of its expediency, and who are well acquainted with the incalculable benefits to society which can be extracted from it. Under their direction, light vans would be established for passengers, and cars for the transport of heavy goods. The natives would by degrees discover the superiority of such a mode of conveyance over that at present in operation, in cheapness, rapidity, and regularity, it would gradually be taken advantage of, and might ultimately become the sole channel of internal communication. By this means an impulse would be given to internal commerce hitherto unknown, and thus would be consummated a measure of vital importance to this portion of India, and one considered essentially necessary for the proper development of the resources of every country.

It were superfluous to point out in detail the various advantages which India would derive from the formation of roads admitting of such easy intercourse, as there is not an individual who would not be directly or indirectly benefited by their establishment, and above all that portion of the population would derive the greatest advantage, who stand most in need of assistance, the cultivators of the soil. In this as in other countries, they form the most numerous and important class of the inhabitants. But in India, in place of the intelligence and industry observed in other countries, the ryot through long oppression, is sunk in poverty, ignorance and apathy, and hardly an effort has been made to raise him from his degraded condition. The formation of such excellent roads would operate immediately in his behalf, by enabling him to bring the produce of his land with facility, to the best market, at the least possible expence. By such means he would be rendered independent of the travelling merchant, the hope of gain would stimulate him to exertion, and that apathy and languor, which are the invariable concomitants of poverty and want of hope, would give place to energy and enterprize. In his journies he would become familiar with new objects, and would be inspired with the desire to obtain them, which

would again act as an additional incitement to renewed exertion. On being brought into collision with the inhabitants of the towns—his mental deficiences could not fail to be made apparent even to himself, and to prevent his children being over-reached by the superior acumen of the citizen, education would necessarily be resorted to. Thus in the train of knowledge all the blessings of civilization would be diffused over the country.

Should the above plan be considered worthy of examination, a committee of gentlemen might without much difficulty collect information on the subject, sufficient to enable them to form an estimate of the expence per mile, on a line of road in the vicinity of the presidency. For example, from Madras to Arcot via Conjevaram and Wallajanuggur. The following rough estimate, for raising a road and constructing upon it a tram-way, may serve as a guide to future enquiries; but I need hardly remark that it is only by an accurate survey of the line of road on which the way is to be formed, that any thing like an approximation to truth can be arrived at:—

Cost per mile.

2,112 prepared granite slabs 5 feet long	Rs. 2112
Levelling, laying down slabs, &c.	583
Bridges	300
Carriage	675
Sleepers	62
Incidental expences	100
	Rs. 3832

As the road betwixt Madras and Wallajanuggur has already been partially raised, and levelled, we may expect that the formation of a tramway upon it would cost considerably less than the estimate I have formed, but taking Rs. 3832 as the average cost per mile—

60 miles the distance betwixt Madras and Wallajanuggur will amount to	229,920
Cost of oxen, carriages, &c. estimated at	53,200
Total cost Rs.	283,120

To justify the above outlay of capital the following is the annual amount of traffic, and its value, on the line of road above alluded to, taken from Captain Cotton's valuable report:—

Traffic.

Fuel	40,000
Straw, &c	5,000
Grain	5,000
Goods	20,000
Passengers, &c. equal to	5,000
	75,000

Present expence of this traffic at 6 Rupees per ton Rupees 450,000

It may be fairly conceded that at least one half of the above traffic, valued at Rs. 225,000 per annum, would pass along the way. Estimating therefore, the current expences of the establishment at Rs. 58,200, there will remain a balance of 166,800. A sum more than sufficient to remunerate liberally the proprietors, and provide for all contingent expences.

However encouraging the above estimate may be of the probable results of such an undertaking, I feel convinced that from its novelty, few private individuals, whether european or native, would be induced to embark in it, without in the first instance obtaining a promise of support from Government. In other countries the state grants patents and monopolies as a recompence for undertaking expensive experiments, of which the public is to reap the benefit. I therefore cannot but confidently expect that Government will approve of, and afford the most efficient assistance to put to the fair test of experiment, a measure supposed to carry in its train the amelioration of the natives over whom they rule. Of its rapid and complete success there can scarcely be entertained a doubt; and a probable consequence of success would be that other companies would spring into existence, and be incited to embark in similar undertakings, " a superior description of roads would thus be introduced over the country, and one rupee would not in future be required from Government either for their execution or support."

It is unnecessary to remark that the roads at present in use in the Madras presidency, are, with a few exceptions, of a very indifferent description, and it appears to me that with reference to the climate, their construction is essentially defective. Every shower loosens the soft materials of which they are composed deep ruts are speedily formed, water collects which sinks down and softens the whole mass to its foundation, and if the road is not immediately repaired, it is by the next fall of rain, utterly destroyed. Tram-ways by preventing the

road being cut up by carriages would in a great degree obviate these defects.

It therefore becomes a subject worthy of consideration, whether it would not be preferable to encourage by every means in our power private individuals to construct granite ways from which a direct revenue would be yielded, than to continue forming common roads at a very great expence from which no pecuniary return is received, and from which very partial benefits to the country are derived. Government have already expended immense sums of money in the construction of roads,* but the necessity of granting a small annual sum for their occasional repair has unfortunately in many instances been overlooked; by such a course of policy and economy, works of the greatest utility, the labours of years, have not infrequently been rendered entirely useless in a few months. The time of the civil establishments is too much occupied to admit of their bestowing that attention to the subject which its great importance demands, and I presume Government are not prepared to establish superintendents of roads, with all the necessary appliances, throughout the presidency. It has therefore evidently become necessary in working out the regeneration of India, for Government to avail themselves of other agency than that over which they possess immediate control, and to delegate their authority and interest in the execution of measures of improvement to the inhabitants themselves, to stimulate them to exertion by holding out honourable rewards—affording them every information requisite for such undertakings, and withholding no aid that will tend to combine them together and induce them to identify themselves with every measure having the prosperity of their own country for its object.

The formation of Joint Stock Companies will at once effect every thing that is desired. It is to them that England is indebted for her railroads, canals, and indeed for almost every establishment of great public utility, carried on as they are by the combined capital and energies of large bodies of individuals. In India, roads constructed by such agency would create a description of international property, in which influential natives, both at Madras and in the provinces, would become partners; such a coalition would not be unattended by its own peculiar advantages, in softening down the distinctions of cast and colour, and of presenting opportunities of introducing with effect other measures of usefulness amongst the native population.

* The high road from Masulipatam to Hydrabad, a distance of 220 miles, has already cost 8¼ lacs of rupees!—and the road from Madras to Poonamallee a distance of 9 miles cost Rs. 450,000.

It may be urged in opposition to the above measure, that the line of road will require to be as carefully levelled for the formation of tram-ways, as for the construction of an edge railroad, and thus one of the most important items of expence in their formation will be fōund equally necessary. There can be no question, that, as we approach a perfect level in the construction of the "way," the more will it approximate to the perfection of an iron railroad, but, from the nature of the Carnatic, a perfect level in most instances will be very easily attained—and embankments for that purpose will be no further necessary than would be requisite in the construction of a good common road ; but, when elevations of any magnitude did occur, the removal of which would entail much expence, an inclined plane might be formed and relays of cattle kept for the purpose of affording assistance. By such an arrangement that objection will in a great measure be removed, while we secure at a moderate expence a most excellent description of road—formed on so firm a basis, of such weighty and solid materials, as to defy the effects of the monsoon, and in other respects to be peculiarly well adapted to this country.

Such are the views which have occurred to me on the subject of internal communication, and the Carnatic presents peculiar facilities for carrying my suggestions into execution, being nearly a perfect level, and abounding in the requisite material. In submitting them, my sole object has been to draw attention to a subject of acknowledged importance, and if roads of the above description were made to intersect the Carnatic, few will be so bold as to doubt that in a few years they would effect an entire change in the statistics of that portion of India.

Madura, 20*th November*, 1838.

To the Editor of the Madras Journal of Science.

My Dear Sir,—I have the pleasure to send you herewith a brief but masterly review of the relative cost and advantages of iron rail-ways and tram-ways as compared to common roads. The author has here shown, beyond all question, the vast preponderance in favour of tram-ways as regards first cost, facility of construction, and durability over iron rails: while, as a means of facilitating transit, they nearly equal them, and excel roads of the common construction by 250 per cent. with the almost incalculable advantage, for this country, over edge-rails, of permitting the free use of all kinds of wheel-carriages the same as on the common road.

When the paper first reached me, I took the liberty of showing it to an influential person, and requested the favour of his opinion as to the propriety of bringing it forward, in such a way, as might perhaps lead to the plan proposed being tried on a few miles of some much frequented road.

This gentleman, though fully coinciding in my opinion as to the beneficial results likely to flow from the adoption of such roads, yet seemed to think, as I understood him, that the expense would prove a bar to their adoption. I was not then, nor indeed am I now, prepared to show by comparative statements that the first expense of laying such a road would not greatly exceed, if indeed it did not actually fall short, supposing Mr. Kellie's estimate nearly correct, of the cost of forming a good road of the common construction. This could be easily ascertained in Madras where the tear and wear of roads is great, and road making and repairing in constant practice. According to Mr. Gordon's table, quoted in the paper, the tear and wear of an iron rail-road is 80—and of a broken-stone road 26 times greater than that of a tram-way, hence, were the cost of making a tram-way 20 times greater than that of a common road, it would still prove the cheaper of the two, leaving altogether out of the question, its superiority as a means of transit. Can more conclusive evidence be adduced in favour of the plan than this table affords?

The destructive tendency of our monsoon is alleged as an objection to this kind of road, this is at best a speculative objection, common roads are well known to suffer most severely from this cause, tram ones have never been tried, and there seems every reason to believe that the massive materials of which they are composed, will effectually counteract causes of destruction, to which loose materials offer no resistance.

I have already remarked that I do not know the average expense of laying a good broken-stone road, but according to Mr. Kellie's estimate, which was submitted to a very able engineer, and who thought it a "roomy estimate," the cost of a tram-way of two lines of stone is about 16 inches for the rupee; and supposing we add 168 rupees to the estimate to give us in round numbers 4000 per mile; we should still have 15 inches for the rupee, at which rate, I question if we could thoroughly break the stones required to make so much really substantial road, 8 feet wide, exclusive of the charges for carting and laying them in their place: and when placed, they require constant attendance to keep them there, if it happens to be a much frequented road. When to these drawbacks we add the difference (250 per cent.) of tractive power required on such roads, I think a very strong case has been made out for giving the plan the benefit of a trial on a considerable scale, and if the result, is

at all commensurate with the calculations, we may reasonably hope, soon to see the plan extending itself in all directions. In this part of India where we have no water carriage, by which to bring the commercial produce of the interior to the coast, good roads are indispensable to its prosperity, and would prove not less advantageous to the native population, than profitable to the European community by the extended mart they would open for the introduction of British manufactures, but which is now nearly closed, through the imperfection of the means of intercourse.

If you can find a place in the Madras Journal for these remarks their insertion, will much oblige.

Dear Sir, Yours truly

ROBERT WIGHT.

IV.—*Geology of Bangalore, and of some other portions of Mysore.—By* JOHN CLARK, ESQ., M. D. *Assistant Surgeon, 13th Light Dragoons.*

It is the remark of the eminent philosopher and physician Sir Thomas Browne, that the world was made to be inhabited by beasts, but studied and contemplated by man. The world is here referred to in a general sense, including the whole world of nature—not in that local and limited sense in which the geologist would view it, who may literally be said to study and contemplate the world—the earth—the matter of which it is formed, and the arrangement of all its parts. It is only however that portion comprehended in the command of its great Creator "and let the dry land appear," which employs the study and contemplation of the geologist. That which the ocean covers, is, like many mysteries in the science, hidden from our eyes, although still open to conjecture. How a world has been formed, is not so much the study of the geologist, as how it has been altered—and two modes have been pursued in investigating this subject—that by conjecture, and that by observation. The first was much employed in the infancy of the science, and the last has happily replaced it. It is only by observing the changes constantly taking place, and the forces or causes which may lead to these changes, that correct and philosophical data can be established. Too much must still be left to conjecture, and it is extremely easy by a well developed organ of constructiveness, to form a

world within our little minds, and alter it by our puny imaginings—a world built indeed upon a sandy foundation. Of the conjectural manner of explaining things, such *has* been, although such is not now, the tendency of the science, and it is our inability to enter into the mysteries of time and eternity—the impossibility of throwing the mind back to that beginning when light shined out of darkness, and of understanding the forces which then operated, that has attached to geology the character of not being one of the exact sciences. The "light which shined in darkness" we only darken by our comments, and it is with us as with the darkness which Scripture tells us "comprehended it not."

In the history of the earth there are but two grand geological facts recorded—its formation and its submergence for a time under water. The universal flood, taken so much into consideration in accounting for the present appearance of the earth, has, perhaps, in its influence, with reference to this portion of the globe, been over estimated—may it be supposed that there was a sudden subsidence of the waters from this the Old Continent, leaving it as it came from the hands of its mighty architect, *ready to be again peopled*, and that there was a gradual retirement of the waters or of the ocean from the new world, with new depositions, and as it were fresh creative bursts—forming and reforming. But leaving what *has* occurred, to what is daily taking place, something may be here said of the agents now in operation which may have altered the surface of that part of the country, the mineralogical features of which are about to be described. And first of decomposition, and its chief agent heat—as the human constitution is susceptible of the effects of heat, so are the rocky masses which cover the country and are hourly crumbling into earth. The rays of a tropical sun act so powerfully that a rock when touched communicates to the hand a burning sensation, and the consequence of this heat, is a state of expansion. As soon as by the setting of this powerful luminary, the great agent in expansion, the cold evening breezes begin to affect the heated rock, condensation follows; and this daily process of expansion and condensation carried on for ages establishes a crack which increases till whole masses are separated. This process of the elements is the one pursued by the natives in quarrying, as they invariably burn logs of wood over the rock to produce a state of expansion, and then sometimes but not always throw cold water upon it—an excellent example of man in total ignorance of the laws of chemistry, observing and imitating the simple laws of nature. These cracks are frequently both perpendicular and horizontal, separating immense cubic masses from each other, the fantastic and irregular appearance of these arising afterwards from unequal decomposition—

some portions undergoing rapid decomposition or resisting it altogether. Many small granite rocks, much exposed to the influence of the weather, exhibit on their surfaces fissures both perpendicular and horizontal, dividing them into small cubic masses, showing distinctly on a small scale the mode of decomposition and separation. It may be remarked, that even the earth from the decomposed rock, when again in some measure by the influence of the sun consolidated into a sort of hardened baked earth, exhibits similar fissures.

Oxydation or oxygenation is another process by which the earth's surface in India is undergoing a great change. In my paper on the lateritic formation this was entered into at some length. To hyper-oxydation and decomposition are owing the lateritic, lithomargic and *intermediate* formations. The lateritic formation is of two kinds—one arising from the hyper-oxydation and decomposition of a rock in *situ*, and the other, from the decomposed materials being afterwards carried by water to a distance, forming a species of detrital laterite. Over the country in every direction, but chiefly in the neighbourhood of the cantonment, deep water-courses or nullahs exist, formed apparently in the following manner, and prevail where the soil is of a red demi-lithomargic character. During the very hot season, the sun acts so powerfully as to produce fissures and cracks all over the ground, and during the rains the water rushing along passes down into these fissures, and large massses of earth give way, forming in time these nullahs or water-courses, which generally terminate in tanks. Tanks abound all over Mysore and are extremely dirty and muddy, and contain a great deal of fine soil, carried thither from the neighbouring fields. The decomposition of rocky eminences into soil, and the delivery of this into the valleys by the rush of water, must tend to establish a more level state of the country.

Near many of these tanks, or where tanks have once existed, the kunkar deposit is often found. Between Mundium and Madoor, on the high road to Seringapatam, there is a very extensive valley, where kunkar is seen accompanied by the black cotton soil; and close to the Mundium tank, in the dry season when the water is low, an impure carbonate of soda and muriate of soda cover the ground like hoarfrost, and small calcareous nodules the size of marbles are intermixed with it. A very interesting question now intrudes itself, viz. how is this kunkar formed? and next to the laterite formation, is the most important with respect to Indian geology.

Kunkar, so universally distributed over India, is considered to be a species of calcareous tufa, divided into that of old formation, and that

which is daily forming. Professor Jamieson says "The first, (the old), "appears to have been deposited from the waters of lakes that formerly "existed in limestone districts, but which have long since disappeared." Of the last he says "The waters which flow along the surface of the "globe and which are charged with calcareous earth, deposit it on the "districts they traverse, and thus form tufas which are either porous "or compact, and are of the newest formation." The best example of the old formation I found in the neighbourhood of Goondlepett, about 30 miles from the bottom of the Neilgherries, and extending towards Mysore. The country there is flat, with few undulations, and with the appearance of having perhaps once been much covered with water. The calcareous tuff in that locality, is either compact, or loose and earthy in texture. The compact I found on the road between Goondlepett and Sindhully, jutting out about 2 or 3 feet from the ground in rounded masses, and sometimes with a most irregular and almost pisiform surface. On being broken into, it showed in the most compact specimens a sparry semi-crystaline appearance, with round darker coloured brown spots—in many of the specimens crystals of quartz were imbedded or attached, and some had a cavernous appearance. It might almost be called a calcareous conglomerate, and answers exactly to that described by Colonel Cullen as existing at Cuddapah, forming many of the inclosures, which indeed it did here. The softer and more earthy kind of kunkar I found in the ditch at Goondlepett, immediately under the soil and covering hornblende and actynolite slate; and an excavation inside the fort showed the same—a bed of kunkar, of a water-worn, irregular and almost coralline appearance. Some of the specimens in the ditch were of a brown approaching to red colour, with pieces of hornblende and actynolite imbedded, described by Dr. Benza, and forming as he says a real breccia. In the rocks, of which the fort is constructed, are some of calcareous spar, and it is more than probable deep sections in the surrounding country would show a limestone rock.

In districts such as this, where the old calcareous or rather kunkareous formation exists, and in many places in India where limestone abounds, the modern kunkar formation can be satisfactorily accounted for. But there are many tracts in India and in Mysore where no trace of ancient kunkar is to be found, and where there are no limestone rocks. How then it may be asked can we account for the formation of this kunkar? Long did I endeavour to do so, but in vain, until a deep section near the road between Mundium and the French Rocks opened up to me some views on the subject. In the section there was decomposing gneiss with beds of hornblende slate, and thick veins of a calcareous substance

somewhat resembling kunkar. In a valley immediately below, there was much kunkar, and a calcareous and clayey soil prevailed for some miles before reaching this place. Near Periapatam, which is not far distant from Coorg, other veins of the same kind were observed, which first directed my attention to the mode in which the far famed black soil of India may be formed. Are these veins from the decomposition of calcareous spar, which we know occurs frequently in hornblende slate? Wherever I have found much kunkar I have remarked that very few rocks elevated themselves above the surface, most likely all of them having undergone decomposition, and the ground has generally looked as if it had once been much under water. I think also that the formation has existed generally in a hornblende neighbourhood—an analysis of hornblende shows that much lime enters into its composition, and perhaps an analysis of hornblende rocks in India might show a larger proportion than even what is met with in Europe. In districts, then, where this ancient kunkar exists, or where limestone abounds, we are able to account for the modern formation, as the calcareous material is afforded, which water takes up and again deposits; but in these localities, where neither ancient kunkar nor limestone is to be found, the only mode of accounting for it, is by taking into consideration the calcareous veins in the decomposing rocks, as seen in the section above mentioned, or allowing for the decomposition of hornblende and granite rocks, containing carbonate of lime. The celebrated Voysey, in his second Report on the Geology of Hyderabad, says of the granite "in several places I have found carbonate of lime a constituent, the quantity very small and only to be detected by effervescence in acids, and a tufaceous limestone is found through the granite in nests and beds."—He again alludes to it as "veins of an earthy carbonate of lime."

Kunkar of an ancient formation has just been described, and one of its localities in Mysore mentioned; but there is another kind found in nodules a few feet below the soil, not in large masses or forming a conglomerate or a breccia. I have found it connected with a black soil, and much hornblende on the surface in small decomposed pieces. These nodules are carried away in baskets to the kilns, and when burnt afford chunam or lime for architectural purposes. I believe it is not considered a very fine kind. The modern formation of kunkar is common, and is found either in small pieces, the size of marbles, strewed over the ground, and sometimes along with an impure carbonate of soda or muriate of soda. or in larger pieces several feet below ground, accompanied with much clay—one locality of this last, about 8 miles from Bangalore, at Madapullay, on the Madras side of Kistnarajaporum, I may here describe.

The nodules are found about the depth of seven or nine feet from the surface. There is first a whitish brownish earth to about the depth of two feet, then about a foot of white clay, to this succeeds a blueish clay, intermixed with a little reddish earth to the depth of 4 or 5 feet, and a blueish whitish earth or clay with lumps of kunkar imbedded in it. There is apparently always much clay connected with the modern formation, and it is likely an analysis of the rocks in the neighbourhood would show a superabundance of felspar with a considerable proportion of carbonate of lime. It is probable also that some chemical action is constantly at work, not by us well understood, but perhaps in some measure similar to that which leads to the formation of saltpetre. Besides this modern formation of kunkar in nodules, I have seen it as an earthy deposit upon rocks in one of the large branches of the Cauveri.

Before leaving this subject I may allude to the existence of small mounds in many parts of the country, and detached fragments of a substance resembling bone: of a white colour and cancelated structure, and considered by the natives to be the burnt bones of giants, and called asurhar or giant's bones. Mention is made of these by Buchanan—and a note upon the subject will be found in the Journal of the Asiatic Society of Bengal for December 1835. Lieut. Newbold, in the October number of the same Journal for 1836, gives an account of substances of a calcareous and siliceous nature found near Bellary, and in the 18th number of the Madras Journal of Science some observations on the same will be found by Dr. Benza and Mr. Cole. Buchanan, Benza and Cole consider them as specimens of calcareous tufa, which some of them most certainly are, but specimens answering to their description were brought me, picked up about twenty-four miles from Bangalore, which were of the same peculiar cancelated structure like bone, but they did not effervesce with acids—they are siliceous and approach closely to, if they are not a coarse kind of semi-opal in a decomposed state. It is necessary therefore to divide these substances so much resembling burnt bones into the calcareous and the siliceous, the last of which appear perhaps to be a sort of opaline siliceous sinter.

The soils around Bangalore and generally in Mysore, may be divided into the black or cotton soil, not common in this part of the country—2d. A rich red soil from the disintegration of rocks containing much iron-like hornblende.—3d. The common or reddish brown soil, where perhaps the iron is in a state of protoxide.—4th. A white siliceous unproductive soil, and.—5th. A clayey soil found in the valleys and below tanks. Besides these five, there is another seen to the south-west of the fort, near a small range of little hillocks of a chlorite rock contain-

ing much iron, the colour is a light rich red. A soil similar to this is to be found between Mysore and Goondlepett, and seems to arise from the decomposition of chlorite slate with an admixture perhaps of hornblende and oxide of iron.

The black cotton soil occupies, according to Dr. Heyne, four-fifths of the Peninsula of India, and the cause or causes which lead to the formation of this soil form an interesting subject in Indian geology. It was referred by Dr. Voysey to the decomposition of a basaltic trap. A passage from some notes kept during a late geological tour bears upon the present point. " Started for Periapatam-road through jungle for four or five miles—soil black, occasionally red.—After this jungly tract, the road passes through a flat country, containing a good deal of black soil, having small pieces of kunkar on the surface, and much impregnated with saline matter. Just before entering Periapatam there is a deep water-course, with masses of basaltic hornblende lying exposed. This section shows for about three feet, the black soil so prevalent over this part of the country—succeeded by a reddish yellow earth, in which were rounded masses of basalt or basaltic hornblende—below this again was gneiss in a decomposing state, containing veins of a calcareous substance similar to what was before described, and having a vertical position." Here then was basaltic trap decomposing into a reddish or rather yellowish earth. How then could it form the black soil which was above? I can only answer by saying, that further on at the bottom of Coorg, I found the same black soil and some way up, but it changed then to red without any particular change in the rock. Now having observed much kunkar for some time before reaching the bottom of these hills, I asked myself the question, whether this black soil did not originate from a jungly country being covered for some time by water, or whether it was not the result of a calcareous admixture. In many parts of the country where this soil exists I have found kunkar beneath, as at Hoonsoor and Yelwall. Hornblende and basalt, as before observed, are constantly seen decomposing into a reddish or yellowish earth, highly ferruginous; and when they do form into the black earth, is it from the quantity of calcareous matter which we know these rocks often contain? or is it from the admixture of calcareous and ferruginous matter, making this far famed soil to be of a calcareo-ferruginous nature. By analysis it has been found to yield chiefly lime and iron, and its very name of cotton ground, from that plant flourishing in it, is in favour of its calcareous origin, for the soil most favourable to the growth of cotton is that which contains a very large proportion of lime. Does not this view of things reconcile the apparently conflicting opinions of Voysey and Benza. Dr. Benza

says "since neither sort of basalt found at present in Central and South "India, decomposes into a black soil, what kind of trap and under "what circumstances different from the present, could this basalt give "rise to such a different product? Is the general opinion of the black "soil having resulted from the decomposition of the basalt one of those "that are repeated only because once told." It appears to me that the kind of trap decomposing into black soil is that which contains much lime; for on the Neilgherries, where it decomposes into a yellow clay, no lime has been found; but in the Hyderabad district, described by Voysey, he mentions as one of the peculiarities of the part, the abundance of the carbonate of lime with the wacken, the basalt &c. &c. &c. and in another place he says "carbonate of lime is intermixed with the rock whether sienite, greenstone, granite, basalt or wacken."

Bangalore is situated on one of the most elevated ridges of the high table land of Mysore, nearly three thousand feet above the level of the sea. The principal rocks in the neighbourhood are gneiss, granite and trap, the formation being entirely primitive. The grand fundamental rock all over the Mysore may be called a sienitic gneiss, for where deep and extensive sections are opened up to view, the rocky masses are distinctly stratified, and contain more or less of quartz, felspar, mica and hornblende. In these sections sometimes beds of quartz and felspar only meet the eye, forming a pegmatite—then again we may find quartz, felspar and mica, forming a true granite or gneiss, and then beds of hornblende and felspar, or hornblende and quartz, forming a hornblende slate.

All the strata around Bangalore, and also throughout Mysore, run more or less north and south, sometimes north-west and south-east, or north-east and south-west, and the trap dykes and basaltic dykes or veins, which are numerous, and cut through the gneiss, have an east and west direction, but sometimes, as near the Madras road, before entering the cantonment, north-west and south-east. A mass of gneiss, about a mile south of the road, and about two from the village of Ulsoor, runs north-east and south-west, and a basaltic dyke cuts through it, running about north-west and south-east or rather N. N. W. and S. S. E. Some very large nullahs, principally towards the west end of the cantonment, one, two or three miles distant however, show well the constitution of the decomposing gneiss, better than can be seen on the surface, where only the more solid and less perishable portions of the rocks remain. In these nullahs we meet with crumbling masses of felspar—large beds of mica or hornblende, and numerous veins of quartz. The common colour of the mica in the undecomposed rock is black, but exhibiting a variety of shades in decomposition—first, it becomes of a brownish

yellow, then a yellow with a tinge of green, and finally it assumes a sort of sulphur yellow or siskin green, the scales of mica scarcely perceptible. When, however, the mica is in contact with or near a vein of quartz, it becomes of a pinkish hue, most likely from the higher oxydation of the iron in the quartz. Immense masses of mica are often seen lying at the bottom of many of these nullahs, and feeling very greasy when touched—indeed mica in many parts of Mysore is very greasy in decomposition, approaching to talc, a talcose mica, or passing into chlorite.

It is perhaps the decomposition of a species of talc-mica with felspar, which affords the very fine white soft and greasy earth found in some of the nullahs, called by the natives shidi munnu, and used occasionally for white-washing their houses. In looking at the different appearances of decomposing mica in the nullahs, one is led to believe what Dr. Thomson says " that it is pretty evident more than one species is at present confounded together under the name of mica, though we have not yet data sufficiently accurate to separate them with accuracy from each other." Magnesia he mentions as one of the constituents of black mica, and it is very probable that magnesia enters into the composition of the micas generally through Mysore, for potstone, a magnesian mineral, is very common through the whole country, although not so in the immediate neighbourhood of Bangalore. The mica and felspar are both very abundant in the gneiss rocks—the mica, as mentioned above, generally of a black colour, and is dispersed through the rock, or in nests or even beds, and sometimes in very small thread like streaks. I have observed when there are large beds a good deal of golden mica is mixed up with it. The felspar is generally white, but frequently of a reddish tinge. The large crystals are often of a light red or pink colour, and when there is nearly a total absence of mica, and the rock approaches to or becomes pegmatite, the reddish felspar predominates.

What is called red granite by Dr. Buchanan I have found in several places in Mysore. I picked up a few specimens to the west or south-west of a very fine bund near the fort—there were no rocks of it, but merely some pieces lying on the ground—the rocks having undergone decomposition. The second place I have met with it is between Closepett and Chinepatam,and the third place between Mundium and Seringapatam. The specimens vary a good deal, but the quantity of felspar of a red colour is very great, and this felspar is of a clayey aspect and peculiar. The specimens from near the bund are alone of this red clayey looking felspar, with glassy quartz, making it a pegmatite. Those between Closepett and Chinepatam are of looser texture, consisting almost altogether of this clayey looking red felspar, with a few crystals of quartz, and numerous

small cavities of a yellow earthy powder, decomposed hornblende, or perhaps iron? Another kind is porphyritic, large, crystals of felspar imbedded, with the same microscopic cavities, this being the rock which Dr. Benza says he is at a loss what to denominate.

Not far from Seringapatam, are some rocks near the road, about 4 miles before entering the town or rather fort, consisting almost entirely of the red clayey looking felspar, with numerous small cavities of a black shining metallic looking substance, what in decomposition seems to afford the yellow earthy powder. This is a rock which I should think has at one time been rather common through Mysore, but has rapidly undergone decomposition, as it appears to contain a good deal of iron. Whilst on the reddish felspar I may mention that there are some gneiss rocks near the gardens of the Horticultural Society, where I have found occasionally some very beautiful specimens—the felspar and quartz of a pinkish tinge, with green streaks and lines, dark green needle-shaped crystals of, I think, epidote, with occasional crystals of kyanite. The next ingredient in the gneiss rocks is the quartz, which is usually of a white colour or having a very slight blue tinge, generally the first when with felspar, and the last when in veins by itself. The light blue sometimes approaches almost to an amethystine colour—small pieces of rock crystal are sometimes picked up, one fine specimen in my possession, containing iron pyrites, was found in some rocks about two miles from the fort. In a small nullah about a mile and a half to the north of the Belfry, and near the boundary hedge of the cantonment, there are large quantities of quartz crystalized into six sided prisms terminated by six sided pyramids. The hornblende, which is found in beds in this gneiss, is seen in the nullahs decomposing into a greyish or greyish green earth.

Gneiss is the prevailing rock around Bangalore, and is generally of the common grey colour, with nests and streaks of black mica, large veins of foliated felspar and quartz, and the strata often very much contorted. The process of decomposition is proceeding rapidly, and where a deep ravine exists, this decomposition is well shown—an immense rock will be found retaining its shape, but quite soft and crumbling down on being touched, veins of quartz traversing the soft disintegrated mass in all directions. In digging to any depth, as in forming wells, after removing a few feet of a brownish earth, we come upon the gneiss rock in a state of decomposition, forming a white stony earth. In the valleys all around, the felspar decomposes into clay, which is used by the potters and chatty manufacturers. Where a bed or vein of quartz highly ferruginous has existed, a quartz laterite has been formed, as on the left-hand side on going towards the fort near the Canarese school

establishment of the Wesleyan Missionary Society. A small village is built upon this kind of laterite, which differs much from that on the western coast, but is somewhat similar to some specimens obtained at Coorg. In some places, as towards the west end of the cantonment, near the very last building appropriated for the stand of arms of a native corps, a thick bed of pebbles is seen below the soil, forming what Dr. Benza would call a lateritic or quartzy detritus.

The highest hills in the immediate neighbourhood are about 4 or 5 miles from the fort to the south of the Kingaree road—these hills run north and south, and are of gneiss and granite with occasionally hornblende slate in the declivities. Hornblende slate is found in several spots jutting out of the soil, chiefly on the west side, its principal locality is in the direction of Kingaree, and near the high hills just spoken of. Basalt is pretty common either in dykes or veins, and, also chiefly to the west, trap dykes the same. These last I shall now describe, but it may be as well first to observe, that there are four principal roads leading into and out of the cantonment—the east or Madras—the south-west or Seringapatam—the south or Trichinopoly and the north or Nundidroog and Bellary. Besides these, there is one about due west, leading to Severndroog, and another about north-west leading to Sera and Chittledroog.

About 8 miles on the Madras road, close to a village and valley where there is much kunkar, and from whence Bangalore is chiefly supplied with chunam, there are several hornblende rocks near the road, and a range of the same is observed running about north and south. This range of trap rocks runs for many miles. On descending the last hill but one on the same road, before entering the village of Ulsoor, and about a mile and a half from it, a trap dyke is observed on the right-hand side. If we now leave the road and turn off to the left in a southerly direction, on a line with this dyke and about half a mile from it, we come upon some black rocks of basaltic hornblende, the continuation of the dyke seen near the road. This basaltic hornblende almost in some of the specimens passes into basalt, and a large gneiss rock a few yards distant from this trap dyke has a basaltic dyke cutting through it—the strata of the gneiss about north-east and south-west, and the dyke north-west and south-east or more correctly N. N. W. and S. S. E. The basaltic dyke in length is about 78 paces—its greatest breadth about 2 feet, and the least about six inches—towards its smaller end a vein of basalt is seen running parallel with it.

We will now take a jump geological and transport the observer to the west end of the cantonment, placing him in a road which leads from the Infantry review ground to the pettah. This road is lined on each side

with trees, and must not be confounded with the military road, less than a quarter of a mile to the eastward of it, which also leads to the pettah. He will here observe another dyke running about east and west. It is seen first in the road, and protruding in rounded masses in the adjoining field; its dark appearance well contrasted with the grey of the granite through which it has burst—the soil resulting from the decomposition of the two is also well contrasted. The greatest breadth of this trap dyke is about 70 paces. On nearly a line with it and going westward, and across a large field, a confused group of granite rocks is seen with a large one of irregular shape perched on the top—one portion of it having been taken away for purposes of building. I mention this elevated portion as it forms a good guide in searching for a dyke of basalt close to it, in the same mass of rock, and only a few feet from it. By the mutual processes of quarrying and decomposition, only a very small portion of the dyke is here visible, and attached to the granite, but on looking to the west end of this group of rocks, distant about 30 yards, the continuation of the dyke is seen running east and west—in breadth two feet at its east end—about 30 paces in length and at its western extremity about two feet three inches in breadth. The granite rock it traverses has a smooth rounded outline, is compact and difficult to break, when broken into exhibiting numerous pinkish dots, the felspar in some places of a light flesh colour and some garnets distributed through it. I picked up a specimen of magnetic iron ore close along side, lying in the field. This basaltic dyke runs east and west and is on a line with, but distant about 27 miles from, the large and celebrated rock of Severndroog, seen rising majestically from the numerous smaller hills around it. Sivagunga lies more to the north-west, and is about the highest hill in Mysore. But to return to the dyke—about 15 paces to the south of it a smaller one is seen running in the same direction and through the same granite block, it is 5½ inches broad at its west end and three at the other, and about 15 paces in length, and deserves more the name of a vein than a dyke—in one place it has suffered displacement. On retracing our steps back to the elevated mass occupying the west end of this group, a small road is observed passing close to it, and leading to a very large gneiss rock in the direction of the pettah—crossing this small path is another dyke of basalt. It has undergone decomposition, and only a few pieces protrude; it is most likely connected with either of the two last described, from which it is distant about 30 yards. Several hundred yards further on in the same field, going west or a little to the north-west, close to a small valley across which a bund has been thrown, there is a

large gneiss rock much quarried, upon which a rude mud hut has been erected. Near this hut another basaltic dyke or vein is seen running about E. N. E. and W S. W. the strata of the gneiss about N. W. and S. E. ; it is 57 paces in length, it seems to have entered from the westward, where its breadth is 8½ inches, takes rather a zigzag course, and at last becomes small and thread like, and is lost in the gneiss. In two places the basalt of the dyke has decomposed on its surface into a brick coloured looking substance.

Crossing the bund, and entering a spot where there is a good deal of cultivation and many trees, we arrive at a tank not of very great size, and not to be confounded with a very fine one near and close to the north-west gate of the pettah. As there is a peculiar arrangement of rocks close to the bund of this tank I will first describe them, before proceeding to the further account of the trap dykes. A large black mass, close to the end of the bund, is seen running down with a considerable slope, and is lost in the tank. At a distance it looks like a basaltic dyke, which I at first took it for, but it runs with the strata, does not cut across them, and is not basalt but hornblende slate. It is a large mass of hornblende slate, perfectly dyke-like in its appearance. The gneiss near it has a very slaty appearance, and contains very little mica, and next to it there are large masses of a very slaty rock of a grey colour, the strata perpendicular to the horizon—it appears to be a sort of argillaceous chlorite slate. Between this chlorite slate and the dyke-like hornblende slate, the gneiss rock, as just described, has undergone alteration, and assumed a slaty aspect. The observer now finds himself on a road which leads into the pettah ; and about a hundred yards from the spot now described, there is a small tope of trees and apparently the continuation of the trap dyke which was seen about half a mile off bursting through granite—this dyke crosses the road, and is seen for miles stretching in a westerly direction, forming little elevations. If instead now of following the road which leads close to a very magnificent tank, and enters the pettah at its north-west angle, we turn off to the right and take the road round the pettah wall, some way on we find a road leading out of the pettah and taking a course about due west—this is the road to Severndroog formerly alluded to. There are some rocks to the south-west of this road, where the geological observer will find another basaltic dyke running about east and west—he also now finds himself in the very region of rocks, in the midst of which there is a very large village and several sawmy houses cut out in the rocks. In a direction further on again, he comes into the high road leading to Kingaree and Seringapatam, which I will now pursue, but

commencing at the gate going out of the pettah and near the fort.

A very short way after leaving this gate, a trap or greenstone dyke is seen close to the road on the left-hand side running for many miles to the westward—it here contains a good deal of felspar, and has numerous needle-shaped crystals of a white colour—this dyke cuts through granite containing very little mica, and is continued on for several miles. About two miles from the pettah gate, it is seen rising into two or three small hills on the left and close to the road. Here the trap assumes a basaltic appearance, and a regular dyke of basalt is observed passing through a granitic mass which lies between the trap rocks and the road, distant from the last about sixty-five paces. I here found a piece of micaceous iron ore. Some rather high granitic rocks are seen on the other side of the trap dyke, forming one end of a large bund which is worth inspecting, and which has been cut through—the masses of granite heaped together in a most confused manner. But resuming the trap dyke, which, as just observed, here forms two hillocks, it now passes to the other side of the Kingaree road, and extends as far as the eye can reach, forming slight elevations. On the other side of the road, and near it, there is a gneiss rock through which a vein of basalt passes, and from this rock a very extensive view is afforded. The trap dyke is seen on the left, near the road, and another is observed to the right, and they both run along for many miles. The one on the right of the gneiss rock is not so broad, but is in large tabular masses, not in rounded blocks, and approaches to regular basalt—a ravine between the two shows beds of pegmatite and of hornblende slate.

The region now under description is quite igneous, the specimens of trap varying in appearance, but more or less either regular basalt or basaltic trap. From this gneiss rock, the trap dyke, before described previous to coming upon the Severndroog road, is also seen. On returning to the main road, and passing through a small tope, the road continues along, leaving the first described trap dyke which stretches out to the west, the direction of the road being now about south-west. A quarter of a mile on, a basaltic dyke traverses the road east and west, the stratification of the rock through which it cuts being north and south—the breadth of this dyke about one foot, two inches. Continuing along this road for some way, a small stream is crossed, granite and gneiss rocks on each side—further on another small stream is passed, and now we find hornblende slate very common. Turning to the left, and following this stream on our way back, large masses of hornblende slate are exposed in the bed of the stream, and near this we come upon a rather high range of granite hills running north and south—the highest in the immediate neighbourhood of

the cantonment. To the south of the small stream, and near the granite hills, two conical and darker coloured hillocks are seen, consisting of chlorite, hornblende and actynolite—the specimens internally of a greyish green or blueish green hue. It is more compact than the generality of the chlorite rocks, and seems to be an intimate admixture of chlorite, hornblende and actynolite. Two miles nearer the cantonment, there is a conical hill, of the same appearance, but not so high, with several small hillocks running from it and taking a south-west course. The largest has a few shrubs growing from between the blocks, which lie in an irregular manner together, glistening in the sun—colour externally of a greyish or greyish blue, with very small holes or cavities, giving the specimens a somewhat variolated appearance. Some particularly in decomposition have a red, iron rust aspect ; these contain much iron, internally of a greyish green with small cavities, containing oxide of iron, and when these are abundant it assumes in decomposition a reddish colour. It consists chiefly of chlorite and oxide of iron, and perhaps there is a little hornblende or actynolite. Following up the little hillocks which run from it, a good deal of quartz pebble is found covering the ground, and much magnetic iron ore distributed about, with large pebbly looking bodies, and pieces of what might be called iron stone, of a brown colour externally, black within from numerous crystals of iron ore, which, with some few small crystals of quartz, decompose into a species of iron clay of a brick red colour and quite indurated.

Chlorite rock is not uncommon in various parts of Mysore, and the hand specimens differ greatly even in the same locality, as in the immediate neighbourhood of the Mooty Tallao or Lake of Pearls, near the hill of Mailcottah, famous for its sanctity and its jewels. I have now before me a great variety of specimens many of them from between Madoor and Mundium where it abounds. One conical hill, upon which a pagoda is erected, on the right of the road, some few miles before reaching Mundium, is in appearance similar to the chlorite hills just described. I did not visit this hill, but the rocks on the road side, and on a level with it, are of chlorite with actynolite, a chlorite rock or slate either alone or with an admixture of hornblende and actynolite, as observed above, is not uncommon, and prevails between Mundium and Madoor, and in the neighbourhood of the Lake of Pearls. Besides the oxide of iron which it contains in nests, iron shot quartz is found and cubic crystals of brown iron stone. The specimens in my possession seem to answer to Dr. Maccullock's second subdivision, varieties. E. F. and G. Chlorite, talc, and potstone pass much into each other, and are arranged by Mr. Allan under the same head—talc comprehending the lighter varieties, and the last, when very coarse and indistinctly granular, forming potstone.

The geological enquirer labours under many disadvantages in India—the climate is constantly opposing him, and the condition of the inhabitants and state of civilization such, that few deep sections ever meet the view as in happier and less barbarous climes. The enquirer in other lands, has only to observe the stones used in building the houses of the inhabitants, from whence he may form some idea of the principal rocks in the neighbourhood; but in India, where mud takes the place of stone, this cannot be done, and we must be satisfied with the sections or nullahs naturally made, in the absence of artificial ones, and betake ourselves to these and to the large wells and tanks, the bunds and sides of which are constructed of stone. In his scientific investigations, the geologist is one, who daily realises the old classic adage, of truth being at the bottom of a well, that is, deep in the bowels of the earth. Of these nullahs three very large ones exist near the cantonment—one about 2 miles from Ulsoor on the north side of the Madras road—another close to the Infantry butts, and another about a quarter of a mile to the south of the Belfry. In many of these the decomposed masses of earth are of a beautiful pink colour, and have assumed a conical shape—I may describe a smaller one, which is distant about a mile and a half west from the Infantry butts, running about east and west, and terminating near a small village—it is somewhat different from the others, and I select it in consequence. At the upper or west end, beds of hornblende slate are exposed, then beds of mica or rather chlorite, sometimes the two running into each other, and decomposing into a yellowish green earth—a little way down the decomposing rock is almost a pegmatite, much red felspar with quartz, with a very slight coating or tinge of chlorite of a yellow green colour—the mica and hornblende are found again predominating, then further on the felspar and quartz—some masses close grained and passing into eurite. At the bottom of the nullah there is a village, as before mentioned, and much hornblende slate with veins of quartz running through it, giving the rocks much the appearance of flinty slate—pieces are lying about of a ferruginous dark appearance from the hyper-oxydation of the iron in the hornblende and quartz. Lying at the bottom of the nullah towards the top, there is also a species of soft chlorite slate. What is called the Belfry, is a small spot of elevated ground, upon which a pagoda, or rather tower, is erected, to the north of this nullah—it consists of lithomarge, and is said to be the highest spot of the table-land of Mysore. The elevation is one mass of lithomarge of a mottled red and white colour, which adheres strongly to the tongue and feels fine and greasy. This

hill of lithomarge confirms me in my views respecting the lithomargic formation, as entered into in other places. It has resulted from the decomposition of a rock or rocks containing hornblende and felspar—the white showing the felspar—the red the hornblende. Basalt has also most likely been contained in the rock originally, for besides pieces of felspar, of hornblende and of quartz, found lying on the surface of the hill, there were some of basalt. I also picked up one piece of magnetic iron ore. Upon the surface of this hill, or rather mound, are small nodules, of a brown colour and quite hard. On breaking into them they are of the colour of brick, with white specks diffused over them and irridescent blue iron spots and streaks; they resemble the pebbly looking bodies found in the chlorite rock along with iron stone. Now these indurated specimens seem to be those pieces of the rock before decomposition which contained much iron. By the kindness of my amiable and excellently informed friend Mr. McGrigor of the 39th regiment with whom, in geological brotherhood, I have visited all the places hitherto described, I am indebted for some specimens of a similar kind to the last, forming small elevations in the neighbourhood of and beyond Nundidroog. Surface irregular and of a reddish brown colour, internally brick red and resembling burnt brick, with lines, streaks and nests of decomposed felspar, as in the lithomarge just described, and spots and lines of a blue ferruginous colour. The soil in the neighbourhood of these hills is red and favourable to the growth of tobacco. These hills then seem to consist of a species of iron clay, intermediate between lithomarge and the laterite of the coast. From minute inspection of the rock, and in agreement with former views on the subject, I consider it entitled to the name of laterite, although it is scarcely cavernous. A study of these specimens, shows the passage of indurated lithomarge into clay stone or laterite. If the original trap rock from which it was produced, contained more felspar than hornblende, and not much iron, lithomarge is formed; but if the rock originally contained more hornblende than felspar and much iron, then the clay stone or laterite is formed. It is this last rock, I should imagine, which is described by Voysey, under the name of iron clay, forming elevated table-land at Beder.

Nundidroog, distant 35 miles north from Bangalore, rises in three majestic hills from the surrounding plain—at the distance it has the appearance of being only one hill, but there are three—one being thrown back some miles does not deserve to be included. It is said to be 1700 feet high. A peculiar kind of granite was brought me from here, but whether from the hill or not the person who brought it could not say—he thinks it was—he forgot to make a memorandum at

the time, and it was in the same bag with others. It looks an aggregate rock—large crystals of grey quartz in a confused mass of felspar of white colour, with only a very few of the very smallest scales of mica, scarcely perceptible. To the west of Bangalore, some most picturesque and beautiful hills are seen running in a direction about north and south. They are of various sizes and show a variety of shape—some of the smaller, peaked, but the greater number having a somewhat cupola or dome shape, mentioned as peculiar to porphyritic granite, which they are. In the midst of this range a large rounded mountain is conspicuous above them all, Severndroog, once famed for its strength as a hill fort, and now still famous for its unhealthiness. The country in the neighbourhood is of a wild and wooded character, which first commences about 3 or 4 miles beyond Tauverkairy, 13 miles from Bangalore. This range of hills is between 20 and 30 miles from the cantonment. About 4 miles beyond Tauverkairy passes the Arkawutty river, the largest in this part of Mysore. In its bed are some beautiful specimens of granite, with red and green felspar, and the mica in decomposition, giving a greenish tinge to the rock. The road after crossing the river ascends, and there is a pass through the hills and rocks which are elevated above the surrounding jungle. The rocks are of granite, showing more or less the porphyritic character—the felspar both red and white. I possess some beautiful specimens which I found lying about, consisting of green felspar with blueish quartz and crystals of red felspar distributed over them, some of the specimens are of red felspar with a chlorite tinge in some places—other specimens again are entirely of green felspar.

Severndroog and the surrounding hills are of porphyritic granite—more marked in some than in others—the felspar red and the mica greenish black. Much trap is seen lying about the road in small pieces, and it is very conspicuous in the rocky hills, giving them a dark appearance in certain places. I have never proceeded further in this direction, but my friend Mr. McGrigor sent me some specimens which he picked up between Coongul and Belloor, apparently a very interesting tract of country: the specimens are trap, of which many of the hills seem to consist—flinty slate, talc slate, actynolite, and chlorite slates, and a species of chlorite porphyry, the felspar red. This is the main road to Semooga, the present capital of Nuggur or Bednore. At Chineroypatam is the famous statue cut out of the solid rock, and near Belloor are the ruins of Hallibede, both of which are well worthy of inspection. Not far from here, are the Baba-Booden hills, giving origin to the Badra river, which uniting with the Tungha near Semooga, forms the Toombuddra. By the kindness of two very zealous and talented botanists,

Lieut. Munro and Mr. Gough, I have been favoured with some specimens of which they say the Baba-Booden hills principally consist. Flinty slate and quartz rock seem common, and are much impregnated with iron. One specimen of flinty slate, or perhaps what Buchanan would call hornstone, affects the magnet, and another is full of particles of iron sand, granular magnetic iron ore. I possess two kinds of the magnetic iron—one an amorphous mass, of a reddish blue colour, highly magnetic, and possessing polarity in a very great degree—in fact the natural magnet or loadstone, apparently the same as found in Siberia and the Hartz. The other specimen or specimens are slaty, tabular slaty masses, externally of a brownish yellow tinge and internally of a dark purple colour. This slaty kind is also highly magnetic, and exhibits polarity in a very high degree. Besides these, there is hæmatitic iron ore, and its passage into a rock which somewhat resembles laterite. An argillaceous potstone seems also to be common; it is of a yellowish brown colour, very soft and greasy, and is I imagine the talcose argellite of Buchanan, some specimens more argillaceous than talcose, and others more talcose than argillaceous.

Another kind of stone I possess of a dark colour externally, but internally of an olive green black, very soft and rather greasy—it is used for manufacturing gods out of. I have not seen it in any other part of Mysore, it may be called a talcose hornblende, being a mixture of either talc or perhaps potstone with hornblende. In the specimen described, the talc predominates over the hornblende, but in some, found between Mysore and Nungengode, the hornblende predominates over the talc and is of a green colour. I am not aware that this rock enters into the formation of the Baba-Boodens, but it is found in the neighbourhood.

The rocks then forming these hills are flinty slate, quartz rock, both much impregnated with iron, the granular magnetic iron ore. Hæmatitic iron ore, slaty magnetic iron ore, and the same in amorphous masses, and argillaceous potstone.

The whole of the Nuggur or Bednore district of Mysore abounds with iron, which I am told fetches a very high price in the Bombay market. At Hurryhur, distant from Bangalore 185 miles, and according to Heyne 1831 feet above the level of Madras, and probably the lowest point in the whole of Mysore, Buchanan tells us the basis of the country is somewhat between an argellite and schistose hornblende, and between the strata of this argillaceous hornblende slate are masses of an earthy quartz or hornstone impregnated with hornblende.

I will now describe some portion of the south-west part of Mysore,

proceeding to the bottom of the Neilgherries, and then turn off at Mysore in the direction of Coorg. The Kingaree road has in some measure been before described, granite and gneiss rocks, with several trap dykes, and much basalt and basaltic trap. About half way hornblende slate in large beds is very abundant, and the country very bleak, and only very slightly cultivated—soil stony and unproductive. Between Biddidy and Closepett the country is wooded, very little cultivation and much pasture land; as we approach the last mentioned place the masses of rock near the roadside are of porphyritic granite, the felspar of a light flesh colour. Closepett, or Ramgiri in the native dialect, has a most picturesque locality in a valley close to the Arkawutty river, enclosed on two sides by hills of considerable height. There is much dense jungle around, and the rocky hills, shaped like Martello towers or bastions, rise up from amidst the jungle. The porphyritic character of the rock is here better marked than in the Severndroog direction, for these belong to the same range. The country immediately on the other side of Closepett is still wooded, but the hills are of much less elevation, and have lost the porphyritic character. To the north of the road there is gneiss, full of garnets of various sizes, strata of the rock running about north and south; and on the road, and bordering it, are detached specimens of a heavy ferruginous looking stone, consisting seemingly of quartz and hornblende.

About half way towards Chinepatam, there is a temple dedicated to Hanuman, the very wonderful monkey god, who with chivalry for distressed damsels perfectly quixotic, led an army over to Ceylon, and delivered from thraldom a beautiful princess. Near this temple are some red rocks, looking at the distance like ant hills. This is the red granite of Buchanan, and has before been described—it chiefly consists of red felspar of a very clayey aspect. A little way beyond this the hills recede, the country opens, and a flat cultivated plain extends on the right, some jungly hills still on the left. The principal rock around Chinepatam is gneiss, but different from the rock round Bangalore, here it is red instead of grey. Around Bangalore the quantity of black mica, with the white felspar and quartz, gives the rock a grey appearance, but here the specimens are beautiful from the quantity of red felspar in patches, veins and streaks. The country continues open, much wet cultivated ground for some miles, succeeded by open plains covered with small bushes, chiefly the *cassia auriculata*, which is very common and used for tanning—very few stones or rocks on or near the road, and those containing red felspar with small garnets. Further on the road becomes very sandy, the soil showing a saline impregnation, and topes of toddy trees cover the country. In the river Madoor, which, as usual with most

of its class in India, contains more sand than water, gneiss is exposed, and many of the pebbles of quartz picked up are of a green colour from chlorite—water-worn pieces of kunkar, like finger coral, are also mixed up with the sand.

Madoor is close to this river, and is a small and as usual dirty village, with much cultivation in the neighbourhood. On leaving Madoor there are some hornblende rocks on the right and close to the road—hills now at considerable distance—ground in long swells, and covered with stones and long grass—pieces of quartz and hornblende on the road, very few rocks. Hornblende slate in various places is seen passing across the road, with much iron sand in the nullahs. About four miles before reaching Mundium, and previous to descending into a very extensive valley, containing much black soil, a small conical shaped hill, with a pagoda on it, is seen on the right-hand side of the road, but distant. It has the same form as the chlorite hills near Bangalore; on the road chlorite slate is picked up in several places, and just on entering the valley there are several rocks of chlorite and actynolite—brown exterior, internal surface decomposing and ferruginous. These specimens vary much, some are altogether of chlorite, others of chlorite and actynolite, the needle-shaped crystals of the last very distinct, and some are very hard and close grained—an argillaceous chlorite. In one place the rock was porphyritic, the basis chlorite with crystals of white felspar imbedded. This valley contains much black soil, with kunkar, and on the Mundium side a stream runs along which has exposed the rock viz. gneiss with large beds of hornblende slate—the felspar in this gneiss of a snow white colour, with silver mica. Near the bungalow at Mundium, outside the wall, are several rocks of hornblende, and on the other side of the large tank salt is manufactured, but of a very impure kind. It is obtained from the soil which in several places betwixt Mundium and Madoor is full of it, and in which the palm flourishes.

Two or three miles from Mundium on the Seringapatam side, the soil is calcareous and clayey. Small pieces of kunkar, like marbles lying about —the ground low and as if once much under water—some hills of slight elevation, running parallel with the road on the left-hand side, and most likely consisting of chlorite slate and actynolite slate, as some specimens were found forming a water-course which passed over the road, along with a porphyritic rock, met with, and to be described, in the bed of the Cauveri near the Wellesly bridge at Seringapatam. In a deep nullah near the road a little way beyond this spot, gneiss rock exposed; felspar red, with beds of hornblende slate, and veins of a calcareous substance resembling kunkar—kunkar in a valley below. Towards Seringa-

patam the country becomes more elevated and barren, much quartz covering the road. Sometimes quartz rock jutting out of the ground, but principally hornblende slate—the road then passes through a range of low hills terminating in the Corighaut hill.

This range of low hills, better seen coming from than going to Seringapatam, is of smooth outline—no deep valleys between—one hill running into another, peaked slightly at top, and sloping down, meeting another of the same formation, and well contrasted with the porphyritic granite of the French Rocks at the distance. These hills of low and smooth outline, and through which the high road passes, are of chlorite slate—the chlorite of a beautiful light green colour and glistening—much quartz in small pieces lying about, and the gneiss rock showing the passage into mica slate. In one spot on the road, the union existing between hornblende, actynolite, tremolite, and asbestos, was well shown, as mentioned by mineralogists, and it would have been difficult to define well and clearly which they decidedly belonged to. Here also there are some rocks of the red stone before mentioned, containing principally a red clayey felspar, with small microscopic cavities of a black shining metallic substance. This region is altogether a very marked and slaty one—the country rather elevated, and very bleak, and with not the least cultivation. As we approach Seringapatam, trap dykes are observed on both sides of the road.

Seringapatam, a place of such classic military celebrity, lies low, and in a valley, high ground on three sides of it. It is built upon an island, formed by the branching of the river Cauveri, 2,412 feet above the level of the sea, and therefore between five and six hundred feet lower than Bangalore. It is a place possessing much interest both to the military and medical man. The eye of the last wanders over it, questioning the reason of its unhealthy celebrity. Many writers, and the very best, Mr. Geddes, are inclined to refer its unhealthiness to its proximity to a jungly tract of country, not entirely overlooking its site, but perhaps not allowing sufficiently for it. If proximity to jungle had any thing to do with it, the French Rocks, distant only six miles, would be similarly unhealthy, which they never have been. It is as healthy a station as Bangalore or any other in the Mysore country. In 1835, the 19th regiment N. I. lost only 5 men—in 1836, 11 men, and in 1837, 18 men—average for the 3 years 11. In all investigations into the sources in general of disease, we are too prone perhaps to attach importance to one particular cause, neglecting the combined influence of minor circumstances—and where one does not stand out prominent, we throw the others aside as perfectly insufficient. No jungles being close at hand, no extensive marshes in the neighbourhood,

the bed of the river being rocky and not muddy, none of the very marked features of miasma present, we dismiss the subject as incapable of explanation.

But allow me to describe Seringapatam particularly as it must have been some years ago, and the description is one that all must confess to be unhealthy—a small island, lying very low, containing a dense and dirty population, enclosed by the high walls of a fort. On looking down from one of the minarets near the gate opposite the Durria Adaulet Baug, we observe, that the fort must have been at one time crowded with houses to the very fort walls, affording a density of population seldom I should imagine equalled. Even now we observe the streets or lanes are extremely narrow, and the collection of filth very great. But density of population and filth cannot alone account for the disease, for many have contracted the fever and died in the Durria Adaulet Baug and Laul Baug. The first still exists, and is considered the public bungalow, a native palace in the centre of a fine park, one of the branches of the river passing near it. Is it here, then, lowness of position alone which is prejudicial? I believe not, and suspect miasma is combined with it. If asked what miasma is, I must borrow a word from an excellent writer, Dr. Fergusson, and say, *nescio.*

I do however believe that we may expect some light to be thrown on the subject by geology. This science has already explained some points connected with disease; the existence, for instance, of goitre in those districts in mountain tracts where limestone is the principal rock; and its not attacking even neighbouring villages, if built on granite, the water of course being calcareous in one, and not in the other. The island and immediate neighbourhood of Seringapatam show, that igneous action has been much in operation. I mentioned above that trap dykes were seen just before entering, and over the northern branch of the river a bridge is thrown, close to which there is an arrangement of rocks worthy of notice—a red looking mass, dyke-like, runs across the river, and is observed to be porphyritic—the basis a red felspar with imbedded crystals of white and reddish felspar, and innumerable needle-shaped crystals of schorl, or perhaps what might be called schorlaceous actynolite—some parts of the rock having a coating of a green substance, chlorite or actynolite. It is a beautiful looking rock, and well contrasted with gneiss, which is along side of it. This gneiss distinctly stratified, and containing much black mica. Along side of this and nearer the bridge, there is a large mass of hornstone running, dyke-like, in the same direction. Hornstone, which is common over the island, is of two shades or colours, one grey and the other blue; the grey kind is

full of elegant moss-like impressions, most likely oxide of manganese; the blue kind does not seem to possess them, but both contain imbedded small crystals of glassy quartz. On the other side of the bridge, the bed of the river is very rocky, and the rock exposed is a gneiss with much red felspar, black or blueish black mica, white quartz, and veins and patches of a light green substance, actynolite. Near this last and forming the bank of the river is a large quantity of kunkar, having a decomposed water-worn and almost osseous appearance. The surface rock on the island is hornblende, and in one place, opposite the Bangalore gate, leading to the public bungalow, it is hornstone, in large tabular masses. From observing the quantity of hornstone in the walls of the fort, I am led to imagine that it must have once prevailed much. The ditch shows gneiss rock decomposing, with beds or dyke-like masses of hornstone traversing it—some of these having a vertical, others an horizontal, position. There are also numerous trap dykes. From trap being the common surface rock, with hornstone and the red porphyry above described, we may I think call the locality an igneous one. It is perhaps needless here to mention, that igneous, or rather volcanic, countries like Italy, &c. &c. &c. are highly miasmatous. There is one point it is necessary to touch on, connected with the subject of the geology of the neighbourhood, I mean the soil. To the east and south-east of the fort there is much cultivation. I observed the sugar-cane in particular, and I may in passing just remark the general unhealthiness of those West India Islands where the sugar-cane is cultivated to a great extent. The soil in this direction is of a black colour, which I have no doubt arises from the constant state of cultivation it is kept in, and from the quantity of water obtained so easily from the neighbouring river. Where there is much cultivation, and where much water is mixed up with a soil, that soil is generally of a black colour. This water it must be borne in mind passes through an immense tract of jungly country, and must contain a very large proportion of vegetable matter. There is another point also. The bed of the Cauveri is full of large rocks which have a clean and healthy look, at least what would not be imagined miasmatous; but may not these large rocky masses with pools of water about them generate miasma? May they not absorb the water and extricate a gaseous and miasmatous principle from the rents and cracks produced by the sun's rays upon them? The granite statue of Memnon is well known to have emitted sounds when the morning beams darted upon it, and M. Humboldt, the greatest authority as a scientific traveller, mentions that from some of the granite rocks of the Orinoco subterranean sounds have been heard, resembling those of an organ, and

supposes them to be produced by the passage of rarified air through the fissures; and he seems to think that the impulse against the elastic scales of mica which intercept the crevices may contribute to modify their expression. The epidemic fevers which prevail on the Orinoco, the natives refer to the noxious exhalations that arise from the *bare rocks* of the rapids. This Humboldt remarks is worthy of attention, on account of its being connected with a fact that has been observed in several parts of the world, although not sufficiently explained. Among the cataracts and falls of the Orinoco, the granite rocks, whenever they are periodically submerged, become smooth and seem as if covered with black-lead. The same appearance is presented at the cataracts of Syene, as well as those of the Congo. This black deposit, according to Mr. Children's analysis, consists of oxide of iron and manganese (so says Mr. Macgillivray, the translator of Humboldt), to which some experiments of Humboldt induced him to add carbon and super-carburetted iron. Mr. Macgillivray goes on to say that this phenomenon has only been observed in the torrid zone in rivers that overflow periodically, and are bounded by primitive rocks. M. Humboldt supposes it to arise from the precipitation of substances chemically dissolved in the water, and not from an efflorescence of matters contained in the rocks themselves. The Cauveri overflows periodically, and its waters pass through a most jungly tract of country.

There is another circumstance connected with the river, which is this—that although there is often but little water, thus leaving bare the rocky masses, water will most likely be near the surface of the ground all over the island, and lead to dampness and exhalation. In the mornings and early part of the forenoon, a dense vapour covers the fort and island, when the neighbouring country is perfectly clear. All valleys and low positions in Mysore, are more or less unhealthy, and are much hotter in the day and colder at nights. The mean annual temperature of Seringapatam is two degrees higher than Bangalore—the average mean lowest of Seringapatam about 63—that of Bangalore 69—the average highest of Seringapatam 90—that of Bangalore 81—a difference of 27 degrees in the one, and only 12 in the other. This alone might account for the prevalence of the fever, and the other circumstances, previously mentioned, explain its malignity.

The rocks between Seringapatam and Mysore are chiefly igneous, trap and porphyry—hornblende seems the most common, and has often on the surface a most variolated aspect. There are few rocks besides the hornblende, not including the usual granite and gneiss, to be met with, but many of the buildings on the road side consist of a rock of a porphyritic character, purple brown compact felspar, with white or reddish

crystals of felspar imbedded, and numerous small pieces of schorl, not so much in needle-shaped crystals, as in dots. Hornstone porphyry appears also to be common and some of the specimens very beautiful. One in particular with crystals of red felspar in a basis of dark coloured hornstone—another kind which formed a dyke running east and west, contained very minute round or oval crystals of felspar, like the eggs of some insects, with needle-shaped crystals of schorl. I found another kind to the left of the road, the hornstone of a dark colour, the felspar crystals chiefly white, with schorl and iron pyrites. Just before entering Mysore there is much hornblende rock, giving a ringing sound under the hammer.

Between Mysore and Seringapatam there are few or no tanks, the country watered by a fine canal, which twists and turns in all directions, and is crossed six or seven times between the two places. Mysore itself lies low, under a very high hill of the same name, a thousand feet above the plain. The country around is slightly elevated; a fine red soil prevails, in some places highly cultivated. A deep section called Purneah's cut, close to the town, enables us to see the formation—the rock is gneiss, in a decomposing state, with veins of quartz and beds of hornblende slate, the mica is of a dark green colour. The gneiss rock here differs from that of Bangalore and Chinepatam, by containing much green mica, and the felspar is both red and white. This cut, according to Hamilton, is thirty miles in length, between thirty and forty feet in breadth, and sunk in some places to the depth of eighty feet through strata of solid rock. Purneah appears to have been a truly clever and public spirited man. The Government ought to erect a monument to his memory, and place it in the very centre of the town, to show how much it appreciates native talent, energy and public zeal, and as an incitement to others of his countrymen.

The stones in the fort of Mysore, within which is the palace of the raja, and those used in constructing the neighbouring fort of Mungerabad, which was commenced by Tippoo, show specimens of the rocks around. The most common is the gneiss just described, white and red felspar, very little quartz, and much green mica in stripes—then there is a rock of red felspar and glassy quartz, felspar predominating, and in large crystals, with only a few scales of mica—red compact felspar with veins of actynolite, and then a sort of porphyritic or augitic hornblende rock. Mysore hill consists of common and porphyritic granite—the felspar is abundant and is either white or with a very slight tinge of red, very light flesh colour—mica blueish and black. The porphyritic character of the rock is best seen from the road leading to Nungengode; the stones on the road used for building show it. The rock at the bottom

of the hill, near what is called the zigzag, is of chlorite and actynolite slate. The rock on the Nungengode side as shown in a large nullah near the road side, opposite the Delwahairy tank, is chlorite, or perhaps more correctly a talcose chlorite slate, with actynolite, and perhaps tremolite. Chlorite, talc, actynolite and hornblende are constantly running into each other, and the specimens are often difficult to define. In nature there are not always those decided specimens which are arranged and described in cabinets—order exists more in the mineralogist's head, than in nature—nature indeed is often very disorderly, but by systems and classifications we endeavour to tie her down.

On the road to Nungengode a chlorite slate, combined perhaps with horn blende, is seen near the above large tank, and is decomposing into a red soil It is of a red colour externally—further on, I picked up specimens where the hornblende predominated over the chlorite, or talcose chlorite—on the road side specimens of magnetic iron ore, with also some of micaceous iron ore. The private bungalow and park of Nungengode, the prettiest spot I have seen in India—the house, in the cottage style, placed on the borders of a fine river, and in a large compound deserving the name of a park, in which are the finest tamarind trees I have ever beheld. Proceeding towards the bridge, by the little path near the water side, we find a ledge of quartz rock impregnated with chlorite, and further on, granite or gneiss, close grained, with very minute specks of black mica —near the bridge much hornblende slate—in one ledge of it, a few garnets—hornblende slate continues on towards Mysore, with much chlorite or talcose chlorite on the road. In the sandy bed of the river, are pieces of kunkar, of a water-worn appearance, of a very light consistence, and like pumice.

Nungengode is a large town, *famous* or rather *infamous* for its pagoda, on which are carved figures of the most indecent character. It was here, where two hundred Jungum priests were murdered. They were called upon to attend the raja, quite unaware of their impending fate, and, on admittance to his presence, whilst bending their heads in token of submission and respect, had them severed from their bodies. Sindhully, a public bungalow about five miles further on, is built on elevated ground—few rocks around—the country covered with long coarse grass—the soil of a very light red—pieces of hornblende and quartz on the ground. One or two decomposing granite and gneiss rocks, and a section near the bungalow, from which water is obtained, shows hornblende slate, the decomposition of which I should imagine gives the colour to the neighbouring fields. On the Goondlepett side of Nungengode are

many topes of toddy trees—much kunkarious soil, with saline impregnation.

The road to Goondlepett is extremely wide, with magnificent trees, of apparently great antiquity, on each side. The country is flat, but not very much cultivated, has the appearance of having been once much under cultivation. On the road ancient kunkar, in rounded masses jutting out of the ground, and blocks of the same kind forming the bunds of some of the tanks. It is almost a calcareous conglomerate, pieces of quartz, actynolite and hornblende mixed with it, and answers to that described by Colonel Cullen as found at Cuddapah. Goondlepett, a place which some years since was almost depopulated by a visitation of cholera, is situated on an extensive plain ; large nodules of kunkar jutting out of the ground, with small pieces lying about—around the fort and in the ditch much actynolite slate, and much kunkar attached to and connected with it. The stones in the walls of the fort consist chiefly of hornblende slate. There is a very pretty rock of red felspar with actynolite, and another a sort of chloritic porphyry. I found a specimen or two of calcareous spar, or perhaps slate spar. The country towards the Neilgherries, which are only distant about 35 miles, is very flat—the calcareous conglomerate showing itself on the road side, gneiss in a decomposing state, with beds of hornblende slate and pegmatite—much quartz hornblende slate and kunkar lying on the road. About 4 miles from Goondlepett, the jungly tract is entered, which surrounds the bottom of the Neilgherries and renders their approach so dangerous.

Before reaching the Tippicado river, there is mica slate in one spot on the road, and the granite, or rather gneiss, assumes a tabular shape and slaty appearance, containing much blueish black mica, a tinge of red in the rock. In the Tippicado river, and around, there is much hornblende slate in large tabular masses, like tombstones, fixed in the earth, and inclining a good deal. The road then winds round these immense mountains, the trees larger, but the jungle not apparently very dense. The Segoor Pass, leading up to the Neilgherries, is the shortest, and, under the scientific superintendence of the engineer officers, the best constructed, of all the ghauts.

The deep sections in this ghaut show hornblende rock and sienitic granite. Towards the top, a little way above what was the Sapper encampment, basalt of a black colour is seen passing into the sienitic granite, and the passage from hornblende rock to basalt distinctly seen. In the sections made in forming the road, the sienitic granite and hornblende rock are found in nodules, decomposing in concentric laminæ, like the layers of an onion. There appears to be more felspar

in the rocks in this ghaut, than any of the others, and masses of it decomposing give a chalky appearance to some parts of the road. Some way down there are beds of compact felspar, through which a green basalt has burst, and mixed itself up with, and the hornblende in the rock then becomes of a green colour, being generally black all over the hills. About Adams Peak, $4\frac{1}{2}$ miles down the ghaut, garnets appear in the rock in nests, and afterwards abound in it. The bottom of the pass is about 400 feet higher than Bangalore. As the Neilgherries are not a part of Mysore, it would be out of place my describing them here, a task so ably and minutely executed by Dr. Benza.

In describing another part of Mysore, I will take a fresh departure from its capital, and proceed in the direction of Coorg. At Yelwall, distant about 9 or 10 miles, the country is elevated and rather bleak, much high coarse grass covering the ground; cultivation in the valleys. In the compound attached to the Residency, there is a good deal of chromate of iron, which was found I believe by Captain Haldane, the officer commanding the Resident's escort; it is lying in pieces on the ground, and near it a rock of hornblende slate of a green colour, which as it has a tinge of yellow externally on its decomposing surface, most likely contains a little of the chromate. At the bottom of the Residency, but outside the wall, there is a nullah, where mica or chlorite slate is exposed. The sand in the nullah abounds with garnets, some of considerable size. Kunkar is also found at Yelwall, some feet below ground, in lumps or nodules of a brownish colour, and irregular, almost pisiform, surface; the soil is inclined to black where it is found, and pieces of hornblende slate cover the ground. There is magnesite also I am informed in the neighbourhood. The road between Yelwall and Hoonsoor is through low jungle, or what in some places would with more propriety be called brushwood; quite a trap region, some specimens of the trap porphyritic, forming a greenstone or hornblende porphyry, crystals of felspar imbedded.

Towards Hoonsoor, much magnetic iron ore on the road. Near this place the country is more jungly, and Hoonsoor itself lies rather low, rising ground on all sides, hilly to the south and west, some of the hills covered with low jungle, the soil both black and red. The locality is a very interesting one, and the mineralogical features were pointed out to me by Mr. Gilchrist. Besides granite, gneiss and trap, of which there are several dykes; the granite and trap decomposing in concentric laminæ, like the basalt *en bouille* of the French, or nodular basalt of Voysey; there is in some places a good deal of a brown and rather compact but not crystaline limestone, or rather ancient kunkar, which instead of being united, as at Goondlepett, with hornblende,

actynolite, quartz and other minerals, forming either a conglomerate or breccia, is found connected with semi-opal, ferruginous opal, or jasper opal. The soil where it is found is black, well contrasted with some high ground near it, which is red, and most likely ferruginous and not calcareous. Much magnetic iron ore on the surface in some places, and sometimes attached to the semi-opal. In a most interesting spot, pointed out to me by Mr. Gilchrist, a low, ragged, and peculiar looking rock, juts out only a foot or so from the ground; it is of a brown shining aspect externally, and I think deserves the name of jasper opal or ferruginous opal, and passes into semi-opal, chalcedony and a coarse kind of jasper. Near this there is found a chloritic talc slate, which graduates into a sort of potstone. The jungly hills to the westward are of granite towards the top, with trap at the bottom; magnesite is found in the neighbourhood.

The road towards Periapatam is for some miles jungly, and then is very flat—much kunkar in small nodules on the surface, trap dykes passing across the road, chiefly of hornblende with crystals of olivine. In several places, found jasper opal, as at Hoonsoor. In a ditch near Periapatam decomposing gneiss, with vertical veins of a tufaceous limestone, and above the gneiss, large masses of nodular basalt, decomposing into a yellow earth with black soil on the surface. In the ditch or nullah, were large masses of basaltic hornblende, ringing on being struck, with a peculiar squeezed appearance, like half wrought images. I have observed this frequently in the basaltic hornblende—is it the result of igneous action under great pressure? A very flat country around Periapatam, with much water and much kunkar in the soil. The country, all the way to Fraserpett or Cushelnugger, is jungly and hilly, with small villages and patches of cultivation here and there. Soil generally black—all the hills appear to be of trap—in one place where a section was afforded, the soil on the surface was black, but reddish below. Near a village about half way, found specimens of a very coarse jasper opal, approaching upon and running into quartz; and a white calcareous like substance, with hornblende slate, decomposing in horizontal strata.

The Coorg mountains are part of the Western Ghauts, and consist of horn blende rock and sienitic granite. The geological formation resembles much that on the Neilgherries—only the hills are smaller, more generally rounded, and show a more perfect state of decomposition into lithomargic earth. Quartz veins and iron ores are not abundant, indeed of the last I saw none; and nothing answering to Benza's hæmatitic iron ore; but it is

very extraordinary how few rocks elevate themselves above the ground. We may wander over one hill and then another for miles, and not meet with a single rock. Decomposition has taken place to a great extent as shown where sections have been made in forming the roads. In some of the deep sections near Mercara much porcelain earth is found in beds in the lithomargic earth, and some of a decomposed earth answering to the shidi munnu in the neighbourhood of Bangalore. In a deep pit about two and a half miles from Mercara, a thick bed of laterite was pointed out to me by my most intelligent friend Dr. Baikie. On the top of some of the hills I found granite or rather pegmatite, and the valleys below of a whiter colour than usual. The hills at Coorg are smaller and more irregularly grouped together, with numerous narrow valleys intervening, many of them so narrow, that the inhabitants cut away a little of the lower portion of some of the hills, in order to cultivate; being able in this way to irrigate. All the valleys I saw contained a light yellow soil, and from this and an inspection of some few of the rocks which occasionally have resisted decomposition, I imagine felspar is the most abundant mineral, which with hornblende has formed the lithomargic earth. On the Neilgherries, the surface of the soil in the valleys is black, with a yellow clay beneath—here the soil in the valleys and generally on the hills is light yellow. There is another great difference in the vegetation. On the Neilgherries many of the hills are bare, or have only trees at their bottom or running up a portion of their sides; whereas at Coorg, most of the hills are covered to their very summits with a variety of trees of the most beautiful kind. The immense quantity of rain which falls (the quantity from June 1835 to May 1836 being 119.14 and from June 1836 to May 1837 87.04—for this information I am indebted to Dr. Baikie), must encourage vegetation, and the decomposition of rock.

According to Dr. Baikie the temperature is most equable, the daily range inside never exceeding 6° or 8°, often not beyond 2°. Thermometer seldom above 74, or below 60. The maximum of barometer occurs during the dry season, the highest noted being 26.220—and the lowest in July during the monsoon 25.912—the greatest daily range observed was .076 the mean .050. Mercara is 4506 feet above the level of the sea, and its mean temperature is perhaps about 68. Ootacamund is 7361 feet, its mean temperature 58.68. Bangalore nearly 3,000 feet, mean temperature about 75. The Western Ghauts consist of hornblende rock, with garnets and sienitic granite—mica is not absent—a micaceous rock with much foliated mica I found at the very top of the Heggula ghaut. Mysore is surrounded on three sides, south, east and west, by the wes-

tern and eastern ghauts, the Neilgherries uniting the two—the passes leading down into Malabar and Canara being very grand.

Iron is generally obtained in Mysore from the iron sand, very abundant in some parts of the country, and washed down into the nullahs. On the Baba Booden hills it is obtained from the magnetic and hæmatitic iron ores. Buchanan mentions its being obtained from two ores at Ghettipura, a village about 7 miles from Maurgree. From his description of the *Aduru Cullu,* it appears to be a quartz much impregnated with iron, the hard specimens called the male stones, and those in a decomposing state, the female. The other ore, mentioned by him under the name of *ipanada,* I imagine to be the magnetic iron ore, pure without any admixture of quartz; for this is found occasionally in the fields and on the roads all over Mysore. In most of the rocks around Bangalore and on the roads, pieces of a very ferruginous looking character are seen. They have the appearance of iron, but are quite light, and do not affect the magnetic needle, but when ground into dust, are attracted strongly by the magnet. I was long unable to define them, but I now think they are specimens of what Dr. Heyne calls ferrilite, a species of hornblende, and from this ferrilite much iron must be derived.

Antimony—one or two specimens of this were brought me by a native from or near the Baba-Boodens. He says it is abundant there, and if so, it is an important discovery, for Dr. Ainslie mentions that this mineral has not hitherto been found in our Indian dominions.

Gold and *silver* have both been found in Mysore. From what I observed at Manantoddy and in the Wynaud jungle, in a direction towards the Neilgherries, I have no doubt gold exists in considerable quantity in this most unhealthy district. At Mullialum, not far from the bottom of the Neilgherries, a species, or rather sub-species, of raja rents from Government the golden region. Mullialum is not in Mysore, but on the borders of it. The golden region is about a mile and a half from the village, and opposite it. A very high mountain is seen rising above the others, shaped somewhat at the top like the head of a violincello. In front of it are a smaller range of hills, and it is on the sides of these where pits are dug, and the yellow or red soil removed and washed for gold. Near these pits, and carried round the small hills, are artificial water-courses, and the soil is taken from the pits in baskets and washed there. In the excavations, along with a very rich yellow soil, are stones of quartz. The surface of the ground is covered with long coarse grass, below which there is about 2 or 3 feet of a red earth, full of pieces of quartz, and below a rich clayey reddish yellow earth. A quartz rock is the prevailing one in the Wynaud, as far as I could observe, and in many

places as at Mellialum is auriferous—it is from the decomposition of this into soil that the gold is procured. Gold was discovered in the eastern provinces of Mysore by Lieutenant Warren of H. M. 33d regiment in 1802—he found it in the small nullahs, or ruts, or breaks, in the ground, at Warrigum, a small village 4½ miles S. W. of Battamungalum —also on the banks of the Palar river, and the Ponian, near Caargory— from a load of this earth near the last, he obtained three sparkles of gold. He found gold also at Marcoopium 3 miles south of Warrigum— here there were mines worked by the natives. Tippoo had worked them also, but desisted on finding that the produce just balanced the expences. The strata described by Lieutenant Warren as existing in the different mines do not agree, but the ore was found in large stones, of a siliceous or quartzy nature, of a black changing to deep rust colour, to which generally adhered a deep orange soft substance. Within the golden tract the proportion generally obtained by him was *one* grain of native gold out of 12 baskets of earth taken at random.

Corundum is found at Mundium near Seringapatam, and in other parts of Mysore, as at Tippity Beygoor, three days march from Bangalore, and Bunercottah, about 12 miles from Beygoor, 9 miles from Bangalore— it is of different colours grey, blue and reddish. Rubies of a coarse kind have been brought me; and also *beryl,* or what Dr. Heyne calls the schorlous beryl.

V.—*Remarks on Cambogia Gutta Linn.—Stalagmitis Gambogioides Murray; and on Laurus Cassia Linn.—By* Robert Wight, M. D.

Two subjects of botanical inquiry, both of considerable interest, have recently engaged my attention; and as the conclusions at which I have arrived are somewhat different from what I anticipated at the out-set, I think a summary of the results may not be uninteresting to your botanical readers. The first of these, taking them up in chronological order, was the examination, for my Illustrations of Indian Botany, of the natural order Guttiferæ for the purpose of marking out its limits and elucidating its Indian genera and species. The second was an endeavour to ascertain the *Laurus Cassia* of Linnæus, and the tree which furnishes the Cassia bark, or *Cassia lignea,* of commerce; undertaken by order of Government, with a view to the solution of a question submitted for its

consideration by the Ceylon Government. Adopting the same course on this occasion, I shall commence my present remarks with the Guttiferæ.

In the 13th number of the Madras Journal of Science I published some observations on the genera of this order, elicited by a communication of Dr. Graham respecting the Gamboge plant of Ceylon. In that paper I showed that the genera *Garcinia* and *Cambogia* of Linnæus were the same, and that *Stalagmitis* of Murray was, so far as could be ascertained from characters only, identical with Roxburgh's *Xanthochymus.* Conceiving the genus *Garcinia* too complex I there proposed subdividing it. The following extract will explain the views I then entertained.

"In my opinion the genus *Garcinia,* as now constituted, ought not to be retained; a glance at the accompanying figures will explain my reasons for thinking so, by exhibiting in one view several of the incongruities which it presents. For example, the *Garcinia mangostana, speciosa,* and *cornea,* have the filaments of the male flower united, forming four large fleshy bodies covered with anthers, and two of the three are known to have a globose, not sulcated fruit. These might form the type of a genus under Rumphius' original name *Mangostana. G. Cambogia,* has the stamens of the male flower ranged in a single row,* round a disk-like receptacle, with a sulcated fruit. This might form the type of a second genus, for which, as nearly corresponding with the character assigned by Linnæus to his *Garcinia,* that name might be retained. In *G. Kydia, Zeylanica, pedunculata, paniculata* and *affinis,* the filaments are united into a staminal column, terminating in a head covered with anthers, fruit usually furrowed. These might form a third genus, retaining for them the now vacant name of *Cambogia*: and lastly, *G. pictoria,* Roxb. (*Mangost. morella* Gært?); *elliptica* Wall. (*fid.* Graham) and Dr. Graham's Ceylon plant, would form a fourth, distinguished by their united filaments, and cup-shaped, one-celled, circumscissile, anthers; for which the now vacant name, *Stalagmitis,* might be retained, in preference to disturbing Roxburgh's *Xanthochymus,* now well established, by rigidly enforcing the rule of priority, and restoring that of Murray, thereby causing considerable confusion in the synonymy, that might thus be easily avoided."

Since the publication of that article much additional light has been thrown on the subject through the publication by Dr. Graham of Edinburgh, in the 2d volume of the Companion to the Botanical Magazine, of a paper entitled "Remarks on the Gamboge tree of Ceylon and char-

* This I now find is an error; Roxburgh, when he prepared the figure of his *Garcinia Cambogia,* was unacquainted with the male flower, and only represents the bi-sexual one.

acter of Hebradendron, a new genus of Guttiferæ, and that to which the tree belongs."

This is an excellent paper, and embodying as it does much very interesting information, well repays the trouble of a careful perusal. I cannot however adopt Dr. Graham's conclusions as to the propriety of elevating this plant to the rank of a distinct genus, nor, supposing that abler botanists than either Dr. G. or myself consider ourselves, admit it as such into the system of plants, do I think his name can be adopted. The question, whether or not this is the Gamboge plant of Ceylon, I look upon as set at rest by the evidence adduced in the "Remarks." All therefore that I have now to consider are simply the following botanical questions—1st, whether this plant ought to form the type of a genus distinct from *Garcinia*?—and 2d, if so, whether it ought to receive a new name? The first of these questions I answer in the negative, because I do not think it sufficiently distinguished from *Garcinia* by the solitary character assigned—the peculiar structure of the anther. The second I equally answer in the negative, because this plant is undoubtedly the type of the genus *Cambogia* of Linnæus, whose name therefore ought to have been retained. My reasons for the first of these conclusions, being fully stated page 122 and 123 of my Illustrations, I subjoin the passage.

" If the precedent established by Dr. Graham in the formation of his genus *Hebradendron* be followed, we may, I fear, soon expect to see the off-sets from *Garcinia* about as numerous as its species now are, since that genus is separated on account of a variation in a single point of structure, and without reference to analogous forms met with in other species. The only point in which it differs from *Garcinia*, as defined in our Prodromus is—in having 1-celled circumscissile anthers—while the more usual form in that genus is to have them two-celled, with introrse, longitudinal dehiscence. Should this be considered a satisfactory reason for its removal, then *G. Kydiana* Roxb., which has a four-sided connectivum, with a polleniferous cell in each face, must equally be separated from the genus, as well as another species of which I possess specimens from Mergui, the anthers of which are 1-celled, dehiscing transversely across the apex. Another variation of structure, which has been long observed in a few species of the genus, will equally demand separation, as being of at least equal generic value; I allude to those in which the stamens of the male flower are united into four thick fleshy androphores, with a highly developed sterile pistil in the centre. Here then, assuming that we are justified in assigning generic value to such variations of structure, limited as they are to the male organization, are four distinct genera, and all, so far as such artificial characters can make them, equally stable.

I confess that I have an objection to this kind of excessive subdivision, inasmuch as, whatever rule holds good with respect to genera, must equally apply to orders, and must inevitably lead to the elevation of half our present species to the rank of genera, and an equal proportion of genera to natural orders; both of which might be avoided by a slight extension of our characters, and still better by a careful and comprehensive investigation of groups of allied species and genera, before attempting their disunion in the formation of new genera and orders. In support of these views, I think I may safely cite the recorded opinion of the first living authority, Mr. Robert Brown. He says, in a letter to Dr. Graham, referring to the plant which has called forth these remarks, "In your plant the structure of the anther is indeed very remarkable, and might well induce you to consider it a new genus; but it is right to add, that approaches to this structure, and which serve to explain its analogy with the ordinary structure of the family, exist in *Garcinia*, with which I suppose your plant would agree in its female flower as well as in fruit." From this concluding caution I imagine that, before establishing a genus on such grounds, he (Brown) would have ascertained the structure of the anther in the whole order, marked its variations, and then, and not till then, have determined on the propriety or otherwise of assigning a generic value to its variations: and I can scarcely avoid thinking, that, had such a course been followed in that instance, a sectional value only would have been awarded.

I confess that a less perfect examination of the order, than that which improved materials has now enabled me to effect, led me into a similar error; on which occasion, I proposed to subdivide the genus *Garcinia* into four distinct genera—*Garcinia*, *Mangostana*, *Cambogia*, and *Stalagmitis* (see *Madras Journal of Science*, vol. 4, page 304). This suggestion has not, so far as I am aware, been yet adopted by any one; and I trust it will not, as I now consider it wrong in principle, the variations in structure there pointed out, not meriting a higher than sectional value in a genus so strictly natural. Influenced by this reduced estimate of the relative value of the several structural variations mentioned above, it is my intention, on the present occasion, to keep the old genus together, but divided into sections in accordance with them. I am induced to do so from observing that the variations are limited to the male flowers, and do not on any occasion extend to the female. For example *G. Mangostana* and *G. cornea*, are referred to the same section; the former has 4-8 celled ovaries, and the latter usually 4; in *G. Kydiana*, Roxburgh describes the berry as being from 4 to 8 seeded, *G. Cowa* from 6 to 8, and most of the others are described as having as far as 4, or 8 seeds, showing a general want of uni-

formity in this respect: variations, therefore, of the number of the cells of the ovary, cannot be admitted as of generic, or even specific value in this genus. Should further acquaintance with the tribe show that, in uniting *Hebradendron* or rather *Cambogia*, Linn. (for they are the same genus, and the latter the more appropriate name) to *Garcinia*, I have erred, the error can be easily corrected, and, in the mean time, my sections will afford the means of more easily determining the known species, and of referring to convenient places such new ones as may be discovered. For the present, nothing is more difficult than to make out from description the species of *Garcinia*. This is mainly owing to the male flowers, which afford by far the best specific characters, being too little attended to in characterizing them. Generally speaking, they are dioicous, and, in collecting specimens, care should be taken to procure them of both sexes. The foliage, except in a very few instances, does not afford good discriminating characters, and when it does, is usually accompanied by others which are more to be relied upon."

My reasons for objecting to Dr. Graham's new name, to the prejudice of Linnæus' old one, is thus briefly explained at page 125 under *Garcinia Cambogia* and *Roxburghii*.

" I have not quoted Linnæus' *Cambogia Gutta* for either of these, though it seems the general opinion of botanists that it belongs to the former. This opinion, however, his brief description of the plant before him in the Flora Zeylanica, shows to be erroneous, and proves almost to demonstration that it is Dr. Graham's *Hebradendron*. The following are his words—*Rami oppositi. Folia lanceolato-ovata, integerrima, petiolata, opposita. Flores verticillati sessiles.* It is in truth the only plant of the genus in Ceylon, having sessile verticelled flowers. In his generic character he describes the anthers, *antheræ subrotundæ*, the pistil *germen subrotundum-striatum, stylus, nullus. Stigma quadrifidum, persistens*, and finally, the pericarp—*Pomum subrotundum, octies sulcatum, octoloculare*—shewing clearly that the character of the flower and ovary is taken from one species, and of the fruit from a different, (or perhaps from Rheede's figure) owing to the imperfection of his specimens, and his not being aware that the lobes of the stigma afford a sure indication of the number of cells of the fruit. His *Cambogia*, however, barring this error, is certainly the Gamboge plant of Ceylon, which is further established, as Dr. Graham informs us, by the examination of the specimen in Herman's herbarium, " which may be considered the type of Linnæus' *Cambogia gutta*."—If, therefore, that plant is to be elevated to the rank of a genus, I should say his name ought unquestionably to be retained with an amended character, and botany relieved from the un-

seemly allusion conveyed under the new one. If Murray's *Stalagmitis* is on account of priority to supplant Roxburgh's *Xanthochymus,* much more must Linnæus' *Cambogia* supplant Graham's *Hebradendron,* partly for the same reason, priority, but principally, because Dr. Graham knew when he gave the name, that his plant was identical with that of Linnæus, while it was almost impossible that Roxburgh could ever recognize his *Xanthochymus* in Murray's character of *Stalagmitis,* made up as it is from two genera (*Garcinia* and *Xanthochymus*) so distinct as not to be referable even to the same natural order. In my opinion *Stalagmitis* ought to be suppressed, and *Xanthochymus* retained."

The allusion to *Stalagmitis* in this passage refers to the following sentence, which I quote from Dr. Graham's paper—"It appears then that the generic name of *Xanthochymus* must be dropped and that the species which belonged to this genus must (for the future) receive the appellation of *Stalagmitis*." This reasoning seems to have carried conviction to Dr. Lindley's mind, as he has acted upon it, so far as to append in his Flora Medica the name *Stalagmitis* to our (Wight and Arnott's) character of *Xanthochymus,* as being the original and legitimate name of the genus: but, apparently without due consideration, as, forgetting the rights of priority in the case of *Cambogia gutta* of Linnæus, he has followed Graham in quoting that name, without any doubt as to the identity of the plants, as a synonym for the very modern *Hebradendron Gambogioides* of Graham. Upon what grounds this degree of favour is to be shown to *Hebradendron* and withheld from *Xanthochymus* I am quite unable to discover or even to conjecture: that Dr. Graham should have inadvertently committed such an oversight is not so much to be wondered at, writing as he was under the excitement of having discovered the long sought Gamboge plant, and the novelty of inventing new generic names; but that Dr. Lindley should, in the retirement of his closet, and totally uninfluenced by the stimulus under which Graham wrote, have followed him without questioning the propriety of what he did, is to me surprising.

In my own and in the name of all working botanists, who are daily called upon to unravel the mazes of involved and perplexed generic names, I enter my protest against such unnecessary changing of names in a science already overburthened with them, and one too which must in its very nature become more and more so every day. To have assigned the name of *Hebradendron Gambogioides* to the very plant which Linnæus called *Cambogia gutta,* and then quote the original name as a synonym of the new one without doubt or question as to the identity of the plants, I hold to be such, and therefore consider it a duty to express—in terms less measured than my

own inclinations, not less than my esteem for the author, dictates— my sentiments regarding it; the more so, as I do not consider the genus itself a tenable one. To its goodness, or otherwise, however, I should not have thought it necessary thus to advert, if the old name had been retained; what I object to is, the inconsistency of, in the same breath, setting up a decidedly bad genus without a single genuine species to support it, for such I hold *Stalagmitis* to be, and putting down a supposed good one, resting on the very same foundation on which its successor is raised, the same species being the basis of both. In the case of Stalagmitis I object to the course pursued, on the ground of its being *ab origine* a spurious genus, constituted partly from notes taken from one species, the flowers of which the author of the genus (Murray) never saw, and partly from flowers of another which he examined, and then, with what ingenuity he was master of, invented from these heterogeneous materials a generic character not referable to either. That every thing might be in just keeping in this curious medley, it now appears, that he had for his only species a specimen made up of the fragments of two plants, no more fit to represent either correctly than his character could amalgamate the peculiarities of both, they being referable to two distinct natural orders. With all this information before him, and hunted out with much labour by Dr. Brown and himself, Dr. Graham, inconsiderately I should hope, tells us that the generic name of *Xanthochymus* must be dropped, and that of *Stalagmitis* put in its place, or, in other words, declares that we must put down a good genus and set up a non-entity, a genus without a species. That one of the two must be dropped is certain; but I hope botanists will show more consideration for the meritorious and diligent labours of Roxburgh, than to displace his really well defined generic name, in favour of one which nobody could understand, or apply from its own terms, and which, now that its inconsistencies have been brought to light, no one could adopt. As I have examined this question somewhat in detail, in a postscript to my article on the Guttiferæ, I shall subjoin it also, for the benefit of those who may not have the opportunity of consulting the original work, in the hope that, by thus calling attention to the subject, my remarks may have the effect of causing botanical authors to pause before they sanction, by adopting them, such uncalled for, and, I fear, if not opposed in time, likely to become mischievous, innovations—I now take leave of the subject, and sincerely hope I may not again have to revert to it.

P. S.—After this article was completed and the greater part of it printed, I received Lindley's "Flora Medica," a new work just issued from the press, and, like all the other works of the accomplished author, form-

ing a most valuable contribution to botanical science; on this occasion in connection with medicine. In this work I find Dr. Lindley has added the weight of his authority, to that of those who adopt Murray's *Stalagmitis* in preference to Roxburgh's *Xanthochymus.* This he does for the reasons adduced by Dr. Graham; namely, that Mr. Brown had examined Murray's specimen and ascertained that it consists of two plants, probably of two genera, one of which, in flower, is a *Xanthochymus,* the other, not in flower, supposed to be Graham's *Hebradendron.* Having expressed my belief that *Xanthochymus* does not belong to this natural order, and having no new species to add, nor other information to communicate respecting it, I did intend to have noticed that genus in this place. But as I have said above that, in my opinion, *Stalagmitis* ought to be suppressed and *Xanthochymus* established in its room, I feel now called upon to state more fully my reasons for thinking so—I shall commence by extracting from the "Companion to the Botanical Magazine" the passage of Mr. Brown's letter, quoted by Dr. Graham as his authority for saying that the generic name *Xanthochymus* must be dropped in favour of *Stalagmitis.* "The plant sent pasted by Konig to Sir Joseph Banks, as one specimen, I have ascertained to be made up of two plants, and very probably of two genera. The union was concealed by sealing wax. The portion in flower, and which agrees in structure with Murray's account, is, I have no doubt, the *Xanthochymus ovalifolius* of Roxburgh. *Stalagmitis* aud *Xanthochymus* are therefore one genus, as Cambessides has already observed, giving the preference to the earlier name of Murray. This, however, forms but a small part of the whole specimen, the larger portion being, I am inclined to think, the same with your plant, of which I have seen, and I believe still possess, the specimen you sent to Don.* The structure, however, of this greater portion cannot be ascertained from the few very young flower-buds belonging to it. It approaches also very closely, in its leaves especially, to that specimen in Hermann's herbarium, which may be considered as the type of Linnæus' *Cambogia gutta.* A loose fruit, pasted on the sheet with Konig's plant, probably belongs to the larger portion, and resembles Gærtner's Morella.

So far all appears clearly in favour of *Stalagmitis,* and had Murray in drawing up his character rigidly confined himself to the description of the flowers before him, I should at once have adopted his name in preference to Roxburgh's. But on turning to his character, as given in Schreber's Genera Plantarum, we find a 4-leaved calyx, a 4-petaled corolla, and a 4-lobed stigma, combined with pentadelphous stamens, 3-

* One of those received from Mrs. Walker.

seeded berries, the stigmas sometimes trifid: stamina not always polyadelphous? &c. From this very unusual combination of quinary and quaternary, forms I am led to infer that the character is only partly derived from the specimen, and partly, if not principally, from notes communicated by König, who, it appears, from the fact of his having combined, on the supposition that they were the same plant, two distinct species, was not aware of the difference, and misled Murray by communicating written characters of a *Garcinia*, and flowers of another plant, and between the two, there has resulted a set of characters not likely to be often found combined in the same species, and still less frequently in one small specimen. Roxburgh, on the other hand, briefly and clearly defines a genus of plants well known to him, and extensively distributed over India, about which he has scarcely left room for a mistake. If further proof be wanted in support of the opinion I have advanced that this is a hybrid genus, I adduce Cambessides, whose authority is quoted for the identity of *Stalagmitis* and *Xanthochymus*. He has strictly followed Murray, adopted all the contradictions of his character, and constituted a genus embodying, first, Roxburgh's genus *Xanthochymus*, next, Petit Thours' *Brindonia*, evidently identical with *Garcinia*; then Loureiro's *Oxycarpus*, also *Garcinia*; and lastly, (if I am not misled by Mr. George Don, whom I am obliged for want of Cambessides own memoir to follow) nearly the whole of Roxburgh's species of *Garcinia*; as if Roxburgh was so bad a botanist as not to be able, with growing plants before him, to distinguish between two genera so very distinct as *Garcinia* and his own *Xanthochymus*. In a paper which I published in the *Madras Journal of Science* for October 1836, I showed, from the internal evidence afforded by the two sets of characters, that Murray's *Stalagmitis* and Roxburgh's *Xanthochymus* were partly identical, and attributed the discrepancies to defects of Murray's solitary specimen; a view, which Mr. Brown has shown to be only partly right, by proving that they in some measure originated in the imperfect observation of König, who supplied Murray with the materials for his genus.

Having now adduced what I esteem conclusive evidence in support of the opinion I advanced above, that Murray's genus is spurious, and that of Cambessides, founded on it, is most unnatural, as associating species that never can combine generically; while Roxburgh's is a strictly natural genus, including several nearly allied species, and, moreover, probably referable to a natural order different from more than half of the species referred to it under the name of *Stalagmitis* by Cambessides: I consider myself fully justified in continuing to adopt the generic name *Xanthochymus* (even though opposed by the highest botanical authorities) until careful examination of the original specimen, with reference to the elucidation of the discrepancies I have indicated, shall have proved that

such actually exist in *that* specimen. If they do exist, then the fault is not Murray's, and his name must of right be adopted with an amended character, excluding the numerous species of *Garcinia* brought under it by Cambessides : if they do not, Roxburgh's genus, which as it now stands is strictly natural, claims the preference.

On the Laurus Cassia of Linnæus, and the plants producing the Cassia Bark of Commerce.

The next subject on which I have some remarks to offer is the *Laurus Cassia* of Linnæus, and the plants producing the *Cassia Lign ea* or Cassia bark of commerce. My attention was first directed to this subject by a communication from Government, in which I am requested to endeavour to ascertain " whether the common Cassia bark of the markets of the world is a thicker and coarser portion of the bark of the genuine cinnamon plant or tree, or whether it is the bark of a plant not analogous to the cinnamon plant or tree."

Before it was possible to return a satisfactory answer to this question, it seemed incumbent on me to ascertain what plant Linnæus meant to designate under the name of *Laurus Cassia*, and whether it was probable the plant so called could supply all the bark passing under that name in the markets of the world. This primary, but most difficult inquiry was rendered indispensable by the, generally supposed, ridiculous assertion of Mr. Marshall, that the leaves, and the bark of the trunk and branches of the *Laurus Cassia* of Linnæus, so far from being aromatic and spicy like cinnamon, are bitter and have in a slight degree the taste and odour of myrrh. This assertion, wide as it may appear of the truth, is yet founded in fact, and what may appear still more extraordinary, has led to a discovery, which, without such aid as he has given, would not probably have soon been made by a professed botanist, a title to which I believe Mr. Marshall does not aspire. He appears to have been led to the discovery, that the *Laurus Cassia* of Linnæus did not produce aromatic bark, simply through the native name, and wonders how it could have received from him the name of *Cassia*, and had qualities attributed to its bark which it does not in the slightest degree possess. I think I can now answer the question, and explain the mystery which has so long hung over this species, and been hitherto rendered only more obscure by each attempt to bring it to light.

It is well known to modern botanists, that many of their earlier predecessors were but indifferent describers of plants, and often very loose in their quotations of figures as synonyms, a sin of which Linnæus was often about as guilty as any of his cotemporaries. He seemed to have had an idea, that their figures were generally at best but approximations to

the truth, and that if a figure exhibited even a remote similarity to a plant before him, especially if from the same country, he might with safety quote it as a synonym. Bearing this in mind, we can easily account for a number of errors to which his incorrect synonyms have given rise. The present instance affords an excellent example of what I have here stated, and one which, but for the discovery of Mr. Marshall, might have long remained undetected.

In Hermans herbarium of Ceylon plants, he (Linnæus) found one bearing the native names of "Dawalkurundu, Nikadawala" under which, it is referred to, or described in Hermans Musæum Zeylanicum. This he considered a species of *Laurus*, apparently from habit alone, and in his usual brief precise style, calls it, Laurus foliis lanceolatis trinerviis nervis supra basin unitis ; having previously called the true cinnamon, "Laurus foliis ovato-oblongis trinerviis basi nervos unientibus." The difference between the two, as indicated by the names, seems very slight, merely depending on the one having lanceolate leaves with the nerves united above the base ; while in the other the leaves are said to be ovate oblong with the nerves distinct to the base—differences small indeed, and such as could never be found of much avail in distinguishing the one plant from the other, since they are both constantly met with in different leaves on the same tree. Such being the case, it is not much to be wondered at that botanists should have been surprised by the boldness of Mr. Marshall's announcement, that two trees, believed to be of the same genus, and so nearly alike in their external forms, should yet differ so very widely in their properties. But so it is, and nothing can be more certain than that the fact is as he states it.

In proceeding to trace the history of the two species, aided by the light Mr. Marshall has thrown on them, our difficulties vanish like mist before the noon-day sun, though Mr. M. himself, has found it "difficult to conceive how the Dawalkurundu obtained the appellation of *Laurus Cassia* from Linnæus." It was because Linnæus's specimen of Dawalkurundu was neither in flower nor in fruit. Had it been so, he was too acute an observer ever to have confounded it with the plants with which he has associated it in his synonyms. This explanation, it may be answered, is mere assumption on my part—it certainly is so, but supported by so strong circumstantial evidence, as not to leave a doubt of its correctness. Linnæus has in his Flora Zeylanica given a short description of each of these species : his description of the cinnamon is principally confined to the flower, and is most precise. In his description of the other, the flower is not once alluded to. Here he declares, that he knows not by what mark to distinguish it from the *Camphorifera japonensium*, which

in its foliage it greatly resembles, but nothing can be more distinct than its inflorescence: that of the camphor tree being a panicle, having a stalk as long as the leaves; while in Dawalkurundu it may be described as a subsessile capitulum, that is, 5 or 6 sessile flowers congested on the apex of a very short peduncle, and surrounded by an involucrum of 4 or 5 leaves; several of which capitula usually form verticels round the naked parts of the branches where the leaves have fallen. He begins his description of *Laurus Cassia** by stating that he at first considered it a variety of the antecedent (cinnamon), but now that he knows not by what mark to distinguish it from *Camphorifera japonensium*, for the leaves are thinner than those of cinnamon, the nerves uniting above the base as in *Camphorifera*, and are sprinkled beneath with a greyish dew *(subtus rore cæsio illinita)* as in the camphor tree, and are at the same time lanceolate and of a thinner texture than the preceding (cinnamon). The whole of his description in short agrees most exactly with Mr. Marshall's description of the Cingalese Dawalkurundu, and leaves not a doubt that both had the same plant in view, and consequently that Mr. Marshall is so far correct in saying that the bark of the *Laurus Cassia* of Linnæus possessed none of the qualities attributed to it. So far all is clear but now the chapter of errors begins.

Had Linnæus been permitted to exercise his own unbiassed judgment in this case, it is not improbable he would have avoided the error of assigning to a plant which, with all his acuteness, he knew not how to distinguish from the camphor tree, the credit of producing Cassia, or at all events would not have done so without some expression of doubt, so as still to leave the question an open one. But, upon consulting other authorities, he found in Burman's Thesaurus Zeylanicus the figure of a species of *Cinnamomum* or *Laurus* as he called the genus, to which Burman had given the name of *Cinnamomum perpetuo florens*, &c. and assigned the native name of Dawalkurundu, not as it appears from the specimen itself having been so named, but because being different from the true cinnamon of which he had seen specimens and figures, he thought it an inferior, wild or jungle sort, and must of necessity be the plant which Herman had described in his Musæum Zeylanicum, though the inflorescence differed much from the description, (a very essential point, which Burman remarked and endeavours to explain away,) and therefore gave it the same Cingalese name. Linnæus's specimen not being in flower, and the resemblance between the specimen and figure being in

* "Hanc speciem olim pro antecedentis varietate habui, nunc vero, qua nota hanc a *Camphorifera japonensium* distinguam, non novi; Folia enim Cinnamomo tenuiora, nervis ante basin coeuntibus ut in Camphorifera; subtus rore cæsio illinita, ut Camphora, et simul lanceolata ac tenuiori substantia quam præcedentis."*Linn. Flor. Zeylanica p.* 62.

other respects considerable, he had not the means of detecting the discrepancy, and unsuspectingly adopted Burman's figure and name as a synonym to his plant.In Rheedes Hortus Malabaricus (1 tab. 57) he found the figure of another cinnamon, even more closely resembling his plant in its general aspect than Burman's figure, this he also associated as a synonym; and Rheedes' plant being lauded on account of the aromatic properties of its bark and leaves, which resemble the true cinnamon, though it is not the genuine cinnamon tree, he seems to have considered himself quite safe in associating this also, and called the three species, this tria juncta in uno plant, *Laurus Cassia*, and assigned it as the source of the officinal "*Cassia Lignea cortex.*"

After this exposition of the origin of the species *Laurus Cassia*, it can scarcely be a matter of surprise that no two botanists have ever agreed as to the plant which ought to bear the name: nor, that not one of them should ever have surmised what plant Linnæus had constituted the type of his species. It is not my intention on the present occasion to extend these remarks, by tracing the various conjectures that have been promulgated on the subject; suffice it to say that no one, so far as I am aware, has taken a similar view as that now explained. It only further remains for me to give some account of the three species thus erroneously associated.

The first mentioned, Dawalkurundu, Linnæus' own plant and the type of the species is, I believe, the *Laurus involucrata* of Vahl, and of Lamark in the Encyclopédie Méthodique, and has in Professor Nees' monograph of the Indian Laurinæ (Wall. Plant. As. rariores), received the name of *Tetradenia Zeylanica*, but is the *Litsea Zeylanica* of a former work of his, a name, which I presume must be restored, owing to the other being preoccupied. The slight difference of structure does not seem to render a new genus necessary.

The second and third have both been referred, by the same eminent botanist, to his variety of the true cinnamon, the *Cinnamomum Zeylanicum*, a decision to which I cannot subscribe, as I cannot perceive that either of these figures are referable to any form of that species, and they besides differ specifically from each other.

The *Cinnamomum perpetuo florens* appears to me a perfectly distinct species, very nearly allied to, if not actually identical with, Nees' own species *C. Sulphuratum*, of which I have now got specimens from Ceylon. This I infer from the appearance of the plant as represented in the figure, for if any dependence is to be placed on the description, it is impossible to admit it into the genus. On this however, I do not feel disposed to place much reliance, as it was not the practice a century ago,

when the description was written, to examine the structure of flowers with the same care that is now bestowed. Should it be objected, that the species I quote as the *C. perpetuo florens* is clothed with yellowish pubescence, which is not mentioned by Burman, then I have another from the same country (Ceylon) perfectly glabrous, agreeing in the form of its leaves, but differing in having more numerous and smaller flowers, which may be substituted, and that I do not think, more than the other, a variety of the genuine cinnamon tree.

The Malabar plant Carua (Hort. Mal. 1. tab 57), on the other hand, I consider a very passable figure of a plant, in my herbarium named, by Nees himself, *Cinnamomum iners* ; but, whether or not I am right in the species to which I have referred it, I can have no hesitation in giving it as my opinion that it is not referable to any form of the *C. Zeylanicum* ; neither can I agree with him in thinking the plant figured under the name of *Laurus Cassia* in the Botanical Magazine No. 1636 is referable to the Ceylon species, but is I think very like the Malabar one, the only species of the genus to which the name *Cassia* should be applied, if that name is still to be retained in botanical nomenclature, as being the only one of the three associated species known to produce that drug. Another plate of the Botanical Magazine (*Laurus Cinamomum* No. 2028) I also refer here, and feel greatly at a loss to account for its introduction into that work under a different name from the preceding. The plant which Nees formerly considered the *Laurus Cassia*, but now calls *Cinnamomum aromaticum*, from China, is a very nearly allied species, but is distinct, and furnishes much of the bark sold in the European markets under the name of Cassia, tho' it has nothing whatever to do with the *Laurus Cassia* of Linnæus, which, from the preceding history appears strictly confined to Ceylon and India proper, and that name, not being referable to any one species, ought unquestionably to be expunged from botanical nomenclature, its longer continuance there only tending to create confusion and uncertainty. This brings me to the next question—namely, what plant or plants yield the Cassia bark of commerce?

The foregoing explanation, in the course of which two plants are referred to as yielding Cassia, greatly simplifies the answer to this one. The first of these is the Malabar Carua figured by Rheede, the second Nees' *Cinnamomum aromaticum*. The list, however, of Cassia producing plants is not limited to these two, but I firmly believe extends to nearly every species of the genus. A set of specimens, submitted for my examination, of the trees furnishing Cassia on the Malabar Coast, presented no fewer than four distinct species; including among them the genuine

cinnamon plant, the bark of the older branches of which, it would appear, exported from that coast as Cassia. Three or four more species are natives of Ceylon, exclusive of the cinnamon proper, all of which greatly resemble the cinnamon plant, and in the woods might easily be mistaken for it, and peeled, though the produce might be inferior. Thus we have from Western India and Ceylon alone, probably not less than six plants producing Cassia; add to these nearly twice as many more species of cinnamomum, the produce of the more eastern states of Asia and the Islands of the Eastern Archipelago, all remarkable for their striking family likeness, all I believe endowed with aromatic properties, and probably the greater part if not the whole contributing something towards the general result, and we at once see the impossibility of awarding to any one individual species the credit of being the source whence the *Cassia Lignea* of commerce is derived; and equally the impropriety of applying to any one of them the comprehensive specific appellation of Cassia, since all sorts of cinnamon-like plants, yielding bark of a quality unfit to bear the designation of cinnamon in the market, are passed off as Cassia.

VI.—*Report upon the Run of the Sea, and Set of the Tides at Madras during the North-East Monsoon.—By* T. G. Taylor, Esq. *Honorable Company's Astronomer.*

To do justice to an enquiry of this nature, it will no doubt be considered necessary that observations should have been continued throughout several monsoons, whereby a knowledge of maximum and minimum effects would have been attained—instead of the particular ones which have been observed in the monsoon of 1838, upon which this report entirely depends; it hence appears necessary that the particulars of the weather experienced in the monsoon of 1838 should first be stated.

The S. W. wind continued to blow steadily up to the 16th October, on which day the N. E. wind set in in a somewhat abrupt and threatening manner; but, relaxing again on the 17th to the S. and S. W., the weather continued fine until the 24th, when the wind again shifted to the N. E.: from this day (which may be considered the commencement of the monsoon) up to the 10th December, when fine weather again returned, the subjoined meteorological register will exhibit the nature of the weather experienced.

Days.	Barometer at			Thermometer at			Rain.		Direction of wind.		
1838	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	Sun rise.	Sun set.	10 A. M.	4 P. M.	10 P. M.
	Ins.	Ins.	Ins.	°	°	°	Ins.	Ins.			
Oct. 24	30,010	30,028	30,062	83,3	85,0	82,0			N E	N E	N E
25	074	000	024	84,0	85,0	80,3			N E	E	N
26	022	29,974	000	81,7	84,0	82,5			N E	N E	N
27	018	948	29,994	79,3	81,6	79,5	1,174	0,467	N	——	N
28	008	—	998	78,6	—	79,3	0.367	0,535	N. N E	——	N
29	036	960	30,018	78,6	80,0	78,7	0,147		N	N	N W
30	068	990	056	79,0	79,4	78,2	0,934	0,117	E	N	N
31	040	980	024	78,7	79,6	79,4	0,944		N W	N	N
Nov. 1	016	978	29,990	80,4	82,5	78,5	0,217		N E	N E	Calm
2	008	958	30,000	80,7	83,8	79,9			N W	N E	
											N E
3	008	954	29,998	81,4	84,0	80,3			N W	N W	N
4	024	—	30,000	78,0	—	78,9	0,667	0,167	N E	——	N W
5	29,990	930	29,976	77,6	76,2	76,4	5,009	0,637	N	N W	N
6	948	910	906	76,5	77,0	76,5	1,382	0,994	N E	N W	N
7	920	876	916	77,7	79,8	78,4	4,700		S W	S E. E	E
8	952	890	940	80,7	81,8	79,1	0,067		E	E	N E
9	966	902	958	80,1	82,0	79,9	3,825	0,037	E	E	N E
10	30,034	914	30,000	78,2	79,0	78,3	1,044	0,067	E	E	N W
11	033	—	003	78,8	—	79,8	1,534	0,107	N. N W	——	N
12	063	964	028	78,2	79,4	78,3	0,127	0,147	E. S E	E	N
13	076	990	064	81,8	81,4	79,7	0,247		N E	E	N E
14	090	30,000	090	81,6	79,9	79,7			N E. E.	N E. E	N E. E
15	124	006	068	77,5	79,9	78,3	0,187	0,377	N	N	N E
16	102	002	088	81,1	80,5	79,5			N E	N E	N E
17	110	022	078	80,8	80,8	79,3			N E	N E	N E
18	076	—	076	78,8	—	77,7			——	——	N E
19	067	012	056	79,5	79,4	77,6			E	N E	N
20	030	29,958	003	78,2	80,0	78,0			N	N	Calm
21	29,982	940	29,952	76,3	78,8	74,7			N. N W	N	do
22	30,014	960	30,006	76,9	79,6	76,0			N. N W	N E	do
23	062	974	033	77,2	79,5	73,5			W	N E. E	do
24	088	986	035	76,4	79,5	76,0			N	N E	N E
25	077	—	054	77,2	—	75,7			E	——	N
26	100	30,004	086	77,3	78,0	76,3			N	N E	N E
27	112	046	126	79,1	80,4	77,3	0,147		N E	E	N E
28	156	072	140	76,3	79,0	78,2	0,091		N W	N E	N E
29	126	042	124	79,0	78,8	76,5			N	E. N E	E N E
30	120	042	114	78,3	78,8	77,5	0,117		N. N E	N. N E	N E
Dec. 1	105	016	072	77,8	78,5	75,7			E. N E	N E	N E
2	086	—	068	76,0	—	76,1			N W	——	N W
			008	77,8	78,8	77,8			N. N W	N. N W	N
3	058	29,990									
4	016	944	29,978	78,7	79,8	76,7			N W	N W. N	N
5	29,968	924	944	76,1	78,0	76,4	0,190	0,317	N	N	N
6	950	*874	906	75,1	76,5	75,7	1,781	0,232	N. N W	N. N W	N N W
7	*896	910	998	75,8	76,8	76,7	1,634	0,067	W. N W	S	S E
8	30,084	988	30,050	78,8	81,0	77,8			E. S E	S E	E N E
9	062	—	050	78,8	—	77,7			N E	——	N E
10	090	004	108	78,7	80,0	77,8			E	E	N

N. B.—The correction for cappillarity which remains to be applied=×,026.

* A very high sea and terrific surf—there had evidently been a strong gale of wind in the neighbourhood. One dhoney came ashore and the Brig Maingay, having broke her anchor, was obliged to put to sea.

Cloudy Max. 10.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 A. M.	Remarks.
5	Fl. cl.	Clear	Haze	
3	Clear	do	Clear	Lightning to the E. at night.
7	Cloudy	Cloudy	Cloudy	Thunder and lightning to the E. do.
	Driz. rain	——	Driz. rain	Do. do. do.
9	do do	——	Fl. cl.	Lightning do.
9	do do	Cloudy	Cloudy	Do. do.
10	Cloudy	do	do	Do. and rain do.
6	Th. haze	do	Fl. cl.	do.
3	Cloudy	Fl. cl.	Clear	Heavy dew.
5	do	Haze	Haze	Dew.
7	Fl. cl.	Fl. cl.	Driz. rain	Thunder and lightning at night.
9	Rain	——	do do	Do. do. do.
10	Cloudy	Cloudy	do do	Squally day and night.
9	do	Rain	do do	Heavy rain evening and night.
5	do	Th. haze	Clear	Vivid lightning do.
9	Fl. cl.	Cloudy	Cloudy	Vivid lightning and one loud and terrific crash of thunder at 7 P. M.
9	Cloudy	do	Fl cl.	Lightning at night.
9	do	do	Driz. rain	Do. do.
8	do	——	Fl. cl.	Thunder and lightning do.
8	Rain	Cloudy	Cloudy	Do. do. do.
6	Fl. cl.	do	Clear	Lightning do.
8	do	do	Rain	Thunder and lightning do.
7	Cloudy	Driz. rain	Clear	Lightning do. with rain.
7	Fl. cl.	Cloudy	Fl. cl.	Do. do.
6	Clear	Fl. cl.	Fl. cl.	Hazy.
5	——	——	Clear	Hazy.
5	Fl. cl.	Fl. cl.	Haze	Hazy.
6	do	do	Th. haze	Hazy.
5	Th. haze	Th. haze	Clear	Heavy dew.
5	do do	do do	Haze	Do. do.
3	Haze	Haze	Clear	Do. do.
	Clear	Clear	do	Do. do.
1	do	——	do	Do. do.
6	Cloudy	Cloudy	Cloudy	Drizzling rain at night.
5	F. cl.	Fl. cl.	Fl. cl.	do.
5	do	Cloudy	do	Generally cloudy throughout the night, wind strong at times.
10	do	Driz. rain	Rain	Generally cloudy throughout the night, wind strong at times.
6	Cloudy	Cloudy	Fl. cl.	Generally cloudy throughout the night, wind strong at times.
3	Fl. cl.	Fl. cl.	Fl. cl.	Generally cloudy throughout the night, wind strong at times.
7	do	——	Cloudy	Generally cloudy throughout the night, wind strong at times.
8	Haze	Cloudy	do	Generally cloudy throughout the night, wind strong at times.
7	Fl. cl.	Fl. cl.	do	Squally.
8	Rain	Cloudy	do	
10	do	Rain	do	Strong wind or light gale at night—thunder & lightning.
9	do	Cloudy	do	Lightning.
5	Fl. cl.	Fl. cl.	Fl. cl.	Do.
3	do	——	do	Do.
3	do	Fl. cl.	do	

On comparing the foregoing register with similar ones during the last forty years, it appears that the monsoon of 1838 has not been particularly distinguished—either for its severity or mildness; and from the evidence of the shipping in the roads, it would appear that a monsoon of full ordinary strength has been experienced. With regard to the particulars of the observations from which this report has been drawn up, I may at once proceed to state, that

The Site chosen for making the observations, was a long range of verandah, situated in front of the Sea Custom House and Master Attendant's Office; at about 200 feet from the edge of the sea and 29 feet above its mean level—immediately opposite to the spot on which stones had been thrown down for the proposed breakwater. On this verandah two stations were selected, 205 feet apart (which I have distinguished as the north and south end of the verandah), from which I was enabled to determine the situation of buoys, &c.

The Instruments employed on shore, were, a five feet achromatic by Dollond (fitted with circles of 4 in. diameter, reading off to minutes, for the measurement of altitude and azimuth, and supplied with a position and double wire micrometer), and a 9 inch theodolite by Dollond—both circles reading off to minutes.

The Apparatus employed at sea, consisted of a small iron buoy (No. 1), anchored in 18 feet water, immediately opposite to and 828 feet distant from the S. station; and a similar one (No. 2), situated at 1131 feet distance from the same, and exactly in a line with No. 1: both of these buoys were held to their anchors, with 6 inch coir cable of 18 fathoms in length. In addition to this, a canoe of 16 feet in length, decked over and well caulked, was anchored opposite to, and 1200 feet distant from the north station; the canoe was furnished with a slender rod of 8 feet in length, nailed to the deck at right angles to its length, for the purpose of indicating the direction of the current; and an apparatus (fig. No. 1) for measuring its velocity:—where A represents an iron flanche, which is screwed on to the stern of the canoe and supports a double jimbol E, on which the connected iron rods D B and B C and wooden bob C, are free to move in every direction. In the case of no current—E

C would be perpendicular ; and corresponding to any given angle of inclination, it might readily be computed what was the velocity of the current: the rod E C being situated *in* the water, it was necessary to attach an index D B (whose inclination could be read off with the position micrometer attached to the 5 feet telescope).

The Times proper for making the observations were next to be considered ; with regard to the tides, the observations on the days near to the new and full moon and at the quarters were evidently the most proper ; and for the set of the sea, those days in which the surf was higher than usual should evidently be adopted ; hence I selected the days following the 1st, 2d, 3d and 4th quarters of the moon, when hourly observations from 6 A. M. to 6 P. M. should be regularly registered, and on any intermediate days in case of a higher surf than ordinary.

The Run of the Sea has been measured by taking the difference between the greatest and least angles of depression of the iron buoy No. 1, which (as has been already stated) was anchored in 18 feet water with 18 fathoms of cable ; these differences being reduced into feet, are as follows :

1838	Remarks.	6h.	7h.	8h.	9h.	10h.	11h.	12h.	1h.	2h.	3h.	4h.	5h.	6h.
		F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.
October 16	Rough sea						4 9							
26							4 3			5 3		4 3		
27	Squally		4 6	4 9	4 4	4 4	4 9	4 9	4 9	4 9	4 9	4 1	3 6	4 4
November 3		4 7	3 4	3 2	3 2	3 2	2 4	3 4	4 1	4 1	3 4	2 9	3 9	
10	Very calm					1 9	2 2							
19			3 2	3 4	3 0	3 2	3 2	2 7	3 2	3 2	3 2	2 4	2 4	
26			2 2	2 4	2 2	2 4	2 0	2 2	2 4	2 6	3 2	3 0	3 2	
December 3	High surf		4 7	4 7	4 7	4 7	5 0	5 0	4 7	4 7	4 3	5 0	5 0	

On the morning of the 6th December the sea and surf had risen to an unusual height, but the only remaining buoy having been washed on shore, I was unable to make further observations. The difference in height between the summit and lowest point of the breakers could not have been less than 8 or 10 feet. Breakers or surf extending ¾ mile from the shore.

The Velocity of the Current.—It was my intention, to have measured the velocity of the current by the "*Indicator*" as already explained ; but, either the iron work was not sufficiently strong, or it offered too great a temptation to some thievish catamaran man,—for the

canoe was overset, and the Indicator wrenched off on the morning of the 2d November ; and the canoe itself broke from its mooring and came ashore on the following day : thus circumstanced, I have caused a catamaram from time to time to be left to float over a measured space, from which the velocity of the current has been computed ; thus—

Date.			Velocity.		By what means measured.
Octr. 1 at 11	A. M.		No percep. current.		By catamaram
16—11	——		0,80 miles per hour		do
25—11	——		1,30	,,	do
26—11	——		2,50	,,	By Massy's Patent Log
26— 1	P. M.		2,52	,, *	By catamaram
27— 7	A. M.		1,87	,,	By Indicator
—— 8	——		1,87	,,	do
—— 9	——		1,87	,,	do
——10	——		1,87	,,	do
——11	——		1,87	,,	do
——12	——		1,90	,,	do
—— 1	P. M.		2,50	,,	do
—— 2	——		2,50	,,	do
—— 3	——		2,50	,,	do
—— 4	——		2,90	,,	do
—— 5	——		2,90	,,	do } The catamaram men refused to go off; but on being urged made the attempt;—after being washed off three times, they lost their catamaram which came ashore near the fort, leaving the men to swim ashore.—Rate of floating about 3 miles per hour.
Novr. 3	11	A. M.	1,50	,,	By catamaram
	5	P. M.	3,00	,,	do
8	11	A. M.	2,01	,,	do
19	11,30	A. M.	1,40	,,	do
	5,30	P. M.	1,30	,,	do
26	11,30	A. M.	0,76	,,	do
	5,0	P. M.	1,40	,,	do
Decr. 3	11,30	A. M.	0,90	,,	do
	4,30	P. M.	1,40	,,	do

The Tides.—The apparatus for determining the times of high and low water, was a pile of 34 feet in length ; which I had intended should be driven in the sea at about 300 yards from the shore : to the upper end of this pile was attached a hollow iron cylinder of 8 feet length, closed at the bottom—which would always be under water—with the exception of a very small hole ; and an aperture left in the top (which

* At 5 P. M. the current had evidently increased in strength, insomuch that the catamaram men refused to go off—saying they could not reach the nearest buoy under two hours.

The direction of the current noticed in the above, was generally parallel with the shore, but on one or two occasions I fancied it had a slight inclination (to the amount of 2 or 3 degrees) *towards* the shore.

would be above water) so as to admit a slight rod to pass freely; this rod being attached to a light hollow copper box—which would float on the surface of the water within the cylinder,—the variation in height of its upper end, would indicate to an observer on shore the variation of the level of the sea, &c. This apparatus was got ready and one attempt made to drive it, but the want of proper anchors, &c. produced a failure, and up to the present time I have not been able to procure the needful to make a second attempt. Under these circumstances I may be permitted to offer observations, which, although not nearly approaching to that degree of accuracy which might be desired, still will supply usefully approximate results. The observations to which I allude consist in deducing from the observed depressions of the sea and buoys, the height of the telescope above the level of the sea; thus, on the 3d of November at 6 A. M., I observed the line of floatation of the buoy No. 1 to be depressed 2° 5′ below the horizon of the sea, hence

	°	′	″	
Depression below the sea	2	5	0	
Dip		5	30	
Depression below the horizon	2	10	30	nat. sin.=,03796

distance of object—× 828 feet

height of telescope above the sea— 31.43 feet

Observed elevations of the Station above the level of the Sea and distance from the shore at which the outer Surf broke.

Date.	Observed with theodolite.			5 feet achromatic.		Remarks
	1st buoy	2d buoy	Surf bks.	Canoe	1st buoy	
1838	Feet	Feet	Feet	Feet		
October 27 at 7 H. A.M.	32,50	33,06	287	32,78		
8 ,,	32,50	32,30	255	32.78		
9 ,,	33,23	33,06	295	33,31		
D. H. M. 10 ,,	33,23	33,40	375	33,13		
(☾ Oct. 26 2 19) 11 ,,	32,26	32,24	373	32,47		
12 ,,	32,02	32,06	460	32,11		Sea too high for catamarans.
1 P. M.	32,02	31,75	420	32,11		
2 ,,	31,54	31,75	390	3 ,77		
3 ,,	31,92	31,75	330	3 ,6d		
4 ,,	32,44	31,92	326	32,11		
5 ,,	33,02	32,50	282	32,61		
Mean..................	32,43	32,53		32,44	Feet Mn 32,47	
Maximum..............	33,23	33,06	460	33,31		
Minimum..............	31,54	31,75	255	31,61		
Difference..............	1,69	1,31		1,70	Mn 1,57	

Approx. time of high water	h. m.	h. m.		h. m.	h. m.
	2 0	2 0		2 30 or mean	—2 10
				☾ culminates at	7 8
				High water bef. ☾ culm.	4 58

Date.	Observed with theodolite			5 feet achromatic.		Remarks.
	1st buoy	2d buoy	Surf bks	1st buoy	2d buoy	
1838	Feet	Feet	Feet	Feet	Feet	
November 3 at 6 A.M.	31,43	31,94	206	32,47	32,41	
7 ,,	31,18	31,57	206	32,21	32,07	
8 ,,	31,06	31,57	206	31,06	30,98	
D. H. M. 9 ,,	30,83	30,89	206	30,87	30,64	
(○ Nov. 2 5 46) 10 ,,	31,31	31,22	245	30,37	32,01	
11 ,,	31,55	32,25	276	31,21	31,97	
12 ,,	32,79	32,76	340	32,27	32,97	
1 P.M.	33,23	33,11	340	32,97	32,48	Rather high surf
2 ,,	33,47	33,97	370	33,70	33,19	
3 ,,	33,23	33,97	397	33,20	33,19	
4 ,,	32,99	33,66	397	32,84	32,89	
5 ,,	32,54	32,94	340	32,62	32,27	
Mean..................	32,14	32,42		32,[illegible]9	32.25	Mean—32,77
Maximum..............	33,97	33,97	397	33.70	33,19	
Minimum..............	30,[illegible]9	30,89	206	30,87	30,64	
Difference..............	2;64	3,08		2,83	2,55	Mean—2,25

Approx. time of high water	h. m.	h. m.		h. m.	h. m.	h. m.
	8 30	9 0		9 30	8 30 or mean	—8 52
					☽ culminates infr.	12 53
					High water bef. ☽ culm.	4 1

Observed elevations of the Station above the level of the Sea, &c.

Date.	Observed with theodolite. 1st buoy		Surf bks	5 feet achromatic 1st buoy		Remark.
1838	Feet		Feet	Feet		
November 19 at 7 A.M	31,31	*	308	30,82	*	
8 ,,	30 58		332	30,70		
9 ,,	31,07		291	30,94		
10 ,,	31,79		308	31,66		
11 ,,	32,03		357	31,90		
D. H. M. 12 ,,	32,51		295	32,15		
(● Nov. 17 1 23) 1 P.M.	32,75		338	33,10		
2 ,,	32,99		338	33,10		
3 ,,	33,23		343	33,58		
4 ,,	32,75		310	33,20		
5 ,,	22,75		290	32,62		
Mean.................	32,16		•	32,16		feet Mean=32,16
Maximum..............	33,23		357	33,58		
Minimum..............	30,58		290	30,70		
Difference.............	2,65			2,88		Mean=2,76

Approx. time of high water	h. m. 8 30	h. m. 8 0 or mean=8 15	h. m.
		☽ culminates	1 22
		High water bef. ☽ culm	5 7

Mem.—The outer buoy had broken from its mooring and come on shore on the morning of the 17th.

Date.	Observed with theodolite. 1st buoy		Surf bks	5 feet achromatic. 1st buoy		Remarks.
1838	Feet.		Feet.	Feet.		
November 26 at 8 A.M.	32,		—	—		
9 ,,	32,51		252	33,00		
10 ,,	32,75		260	33,20		
11 ,,	33,23		267	33,92		
D. H. M. (☽ Nov. 24 11 53) 12 ,,	32,51		265	32,96		
1 P.M.	32,27		260	32,48		
2 ,,	31,55		268	32,00		
3 ,,	31,55		316	31,52		
4 ,,	31,31		311	31,04		
5 ,,	81,11		296	31,76		
Mean..................	32.16			32,43		feet Mean=32,30
Maximum..............	33,23		316	33,92		
Minimum..............	31,31		252	31,04		
Difference..............	1,92			† 2,88		

Approx. time of high water	h. m. 3 30	h. m. 4 0 or mean—3 45	h. m.
		☽ culminates..	7 30
		High water bef. ☽ culm.	3 45

* The second or outer buoy had parted from her anchor and come ashore.
† This result is evidently too large and had better be omitted.

Observed elevations of the Station above the level of the Sea, &c.

Date.		Observed with theodolite.		5 feet achromatic.	Remarks.
		1st buoy	Surf bks.	1st buoy	
1838		Feet	Feet	Feet	
December 3	at 7 A. M.	32,27	390	31,99	
	8 ,,	31,31	367	31,75	
	9 ,,	31,31	367	31,03	
D. H. M.	10 ,,	31,07	361	31,75	
(○ Decr. 1 4 55)	11 ,,	31;43	401	31,99	* The disturbed state of the sky and sea renders the observations of this day less satisfactory.
	12 ,,	31,90	411	32,47	
	1 P. M.	32,99	397	33,30	
	2 ,,	33,71	413	33,67	
	3 ,,	34,19	421	33,91	
	4 ,,	33,71	449	33,43	
	5 ,,	32,99	397	32,71	
Mean..........................		32,44		32,54	feet Mean=32,49
Maximum......................		34,19	449	33,91	
Minimum....		31,07	367	31,03	
Difference..................		3,12		2,88	Mean 3,00
Approximate time of high water		h. m. 9 30	h. m. 9 0	or mean=9 15 h. m.	

☽ culminates inf. 13 37

High water bef. ☽ culminates 4 22

Collecting these several results it appears that the amount of tide experienced at Madras, is

Amount of tide.	F. I.	High water. H. M.
At the new and full moon	2 10	4 26 bef. ☽ culminates.
At the quarters............	1 9	

The above observations and results are the best under the circumstances attending them that I have been able to obtain ; in addition to these I have but little to state, and that little being more the result of casual than precise observation, of course is entitled to proportionally less credit. To sum up the whole, it appears that, on an average of 40 years, the north-east monsoon sets in on the 19th day of October, being very rarely as much as 10 days earlier or later ; and that, although the north-east wind continues generally until the middle of February, still the force of its effect seldom extends beyond the 10th of December. It further appears that commencing with the N. E. wind, a current of variable velocity sets in from the north, in a direction parallel with the shore; and that it generally increases in strength in the course of the day, and decreases during the night,* and is moreover influenced by the strength of the wind; the current appears to reach its maximum velocity about the 1st of November, when in conjunction with the tide it amounts to three miles per hour; and from this time decreases until the 10th of December, when it amounts to a small fraction of a mile per hour only. During this interval, the sea, upon a squally day—such as it would be dangerous if not impossible for boats to go off on,—may be stated to rise two and a half feet above, and to sink as much below, its mean level :—and in the case of a gale of wind it may possibly reach to the double of this amount.

Varying with the run of the sea is the height of the surf, and the distance from the shore at which the outer surf breaks ; being modified however by the wind and current. In a squally day, such as would be dangerous to catamarams or boats, the outer surf breaks at a distance of 4 0 feet from the shore, and in the case of a gale of wind,† the surf broke on the outside of the nearest buoy (which is 828 feet from the shore‡) : but on occasions of this nature the swell, breakers, and surf

* This remark although not invariably confirmed by the foregoing observations, is nevertheless I believe generally true : the catamaram men and boat men state that the current is always stronger in the afternoon than in the morning

† The very high surf experienced on the 6th December, although not resulting from a gale of wind at Madras, evidently had its origin in one at no great distance.

‡ I was not at the beach on this day ; but from the testimony of the Master Attendant and his deputy there can be but little doubt of this statement being correct.

merge the one into the other, so as to render it difficult to decide at what point the surf first breaks. The particulars with regard to the tides (already given at the beginning of the last page) differ in some respects from those found some years ago by Col. De Havilland: it is probable, however, that his observations were not made during the north-east monsoon, to which the results here given particularly belong.

Madras, 19*th December*, 1838.

N. B.—The above elevations of the *Station* above the level of the sea with the 5 feet telescope, have for the sake of comparison been reduced to the same elevation as those of the theodolite—we have—

	F.	I.
Elevation of theodolite station above mean level of the sea	32	4
———————above the floor of the verandah	5	1
Floor of verandah above mean level of sea	27	3

VII.—*The comparative cheapness of Large and Small arched Bridges.*

To the Editor of the Madras Journal of Literature and Science.

Dear Sir,—It is some time since we heard that Government was going to construct a work of vast public utility near Trichinopoly, namely a permanent bridge across the river Cauvery, and it is now rumoured that the Court of Directors have liberally sanctioned this beneficial undertaking; and determined, as the most economical mode of construction, that it shall consist of 40 small arches.

Now as I feel rather sceptical whether this notion of economy is correct, and it would be a pity to see a work of this kind constructed without regard to appearance, if nothing is gained by the neglect, I have determined to submit the question of the comparative cheapness of large and small arched bridges, to the learned among your readers; in hopes, if I am wrong, of having my doubts removed; or, if I am right, of conferring a benefit on our Trichinopoly public by promoting the better ornamenting of the town.

There are two ways in which people commonly talk of bridges; either as an artificial platform, from one side of a river to the other, which is cheap in proportion as it is thin; or as a road-way, supported by piers,

and less costly, as it has fewer of these piers. In these summaries the first position only seems to deserve investigation; for, if I am rightly informed, the difference in the amount of materials in the two cases, varies only as the span of the arch, and is not affected at all, by the number of piers; that is, the strength of the piers may be regulated in direct proportion to the span of arch; if the span be double, the piers too must be twice as thick; so that in the whole length of the bridge, the solid dimensions of the pier work are equal, whatever be the distance apart; but on the other hand, wider arches must be thicker than narrow, or they will not stand.

Architects tell us, that a bridge arch (of any but the very smallest dimensions), is not safe, unless it have at least one and a half feet of thickness at the apex, and it seems to be further agreed, that this thickness is sufficient for a span of 36 feet; all smaller arches therefore would seem to involve a waste of strength, or have a thicker platform than is required, and therefore they ought not to be built.

In proportion as this limit is exceeded, it appears, then, that the platform must be thickened, whilst the piers must also be augmented, as before described, in such a ratio, as to make the total of their thickness, just what it would be, if the spans were no more than 36 feet; we may therefore conclude that a brick bridge contains the smallest possible quantity of materials compatible with strength, if its arches have a span of 36 feet: but is it therefore less expensive?

To determine this, keeping out of sight for the present the question of risk from more impeded water-way, the following propositions should be solved: namely, whether, two piers, say of 6 feet, can be built for the same money as one of 12 feet; whether the difficulty and consequent liability to error is increased or diminished by multiplying the works in the bed of a river; whether (remembering that bricklayers are paid by the day and not by the quantity of work done) we are to suppose that more or fewer tiers of arch-work will be laid in the same time, each series requiring a fresh adjustment, by having fewer or more angles of direction to consult for the joints; whether (all arches being considered works of skill), the likelihood of individual or partial failure is diminished or increased by the numerical amount of such works of skill; whether a sinking of the piers is more to be anticipated when the foundations are many and narrow, or few and broad; whether danger of unequal subsidence of the arches is greater or less, as there are many or few arches to subside; and, lastly, whether all these sources of error and hindrances to the workmen would not in the end render the many arched bridge a work costing more money than one, more nearly ap-

proaching the dimensions which are now usually adopted in Europe: I will end my queries by asking whether I am still entitled to subscribe myself,

A non contributing reader ?

AMICO-PONTICULUS.

TRICHINOPOLY, 5th *August*, 1838.

VIII.—*A remarkable Appearance in the Indian Seas; in a Letter from Lieutenant* DAWSON. *Communicated by* WILLIAM NEWNHAM, ESQ.

I beg leave to lay before the meeting an extract from the private journal of Lieutenant Henry Dawson, a very intelligent officer of the Royal Navy, at present employed on civil duties with the Indian Navy at Bombay, containing an account of a very extraordinary phenomenon, which was observed on the passage from Bombay to the Persian Gulf (the southern passage), on board the Honourable Company's sloop of war Clive, in 1832. On my first going to India, I was in the habit of intimacy with the late Captain David Seton, who was many years resident at Muscat, and I well remember hearing him relate the circumstance of falling in with the *white sea*, described by Mr. Dawson, on his occasional voyages to Muscat, during the period of the south-west monsoon.* So many years, however, have since elapsed, I am unable to give any more detail of the circumstance related by that officer, and merely here allude to it in proof of the phenomenon having been before observed.

WILLIAM NEWNHAM.

During a passage from Bombay to the Persian Gulf, on board the Honourable Company's sloop Clive, on the 22nd of August, 1832, at a quarter before eight o'clock at night, a phenomenon appeared of the following nature, and to all on board, of an unheard-of-kind, which gave

* Our subsequent inquiries serve to confirm this statement, inasmuch as few navigators appear to have passed along the eastern coast of Arabia, in the months of June, July, and August, without noticing the discolourment of the water (but *during the night only)*, and which, on examination when brought on board, is said to exhibit no difference whatever from sea-water in other parts of the ocean.—ED. *Jour. R. A. S.*

rise to transitory feelings of apprehension as to the vessel's contiguity to danger. Sailing under double-reefed top-sails and foresail, at the rate of nine and a half miles per hour, before a strong south-west monsoon wind, and a high sea, without any indication of a change in the elements, the ship was surrounded *instanter* by water as white as milk or snow; it seemed to have no termination until it reached an altitude of seventy-five or eighty degrees, where it subsided in a strongly marked ecliptic, above which the heavens presented a beautiful and bright blueish cast, not dissimilar to polished steel. No line of horizon was visible; the dead white colour of the water close to the ship, as it increased in distance from her very gradually brightened, until, where I supposed the horizon to be, it assumed a silvery aspect, which, increasing as it ascended, became brilliant and dazzling towards the zenith, obscuring the stars and clouds which had before this visitation been distinctly visible. The sea in a moment became smooth; the ship, from rolling and labouring considerably, quite steady; no diminution in the wind occurred, but a sensation that it had fallen, even to a calm, was general, but momentary. This delusion was occasioned by the instantaneous steadiness of the vessel, as well as the cessation of the previous noise from the lashing of a mountainous and confused sea against the vessel's sides, and on her decks; her progress through the sea, however closely scrutinised, could not be observed; the disturbed water alongside and in her wake, as well as the foam around her bows, did not contrast with the adjoining unagitated fluid, notwithstanding, from the velocity of the ship through the water, these must have been considerable. Not a particle of phosphoric matter was once observable, either in the surrounding ocean, or in the water immediately displaced by the ship's passage through it; but when taken up in a bucket, and agitated with the hand, such was visible, but not in a greater proportion then is usual, nor did the water vary in appearance from common sea-water: nothing could be perceived to attribute this strange phenomenon to.

Animalcules of a minute kind were perceptible, as likewise a few pieces of a glutinous substance of a purple colour, but neither in any considerable quantity, nor differing from what is usually found in the seas of the Indian Ocean.

We sailed the distance of fifteen miles without the slightest change in the appearance of the sea or sky, when in a moment this extraordinary phenomenon vanished, the ship at the same instant encountering the like high and turbulent sea as previous to her envelopement.

The ship was not within one hundred miles of the eastern coast of Arabia, or of soundings, but sailing in what is termed deep ocean water.

I have before mentioned that the ship was quite steady during her progress through the white water: this was the case, with the exception, that in a few instances she gave a heavy roll, as if influenced by a following swell; these were not more frequent than once in a quarter of an hour. Latitude 21° 40′ north, 59° 40′ east; thermometer 87°, barometer twenty-nine inches and nine-tenths.

The phenomenon I have attempted to describe appeared twice after we were first extricated from it, for periods of about twenty minutes; its brilliancy, as well as influence over the waves, as previously described; the tr ansition from high and mountainous seas to a smooth and seemingly quiet ocean, and change again to turbulence, was as sudden as a flash of lightning.

On my arrival at Muscat, a few days after, I endeavoured to gain some information on the foregoing matter, but beyond finding that the phenomenon was occasionally met during the strength of the south-west monsoon, about the limit noted, and that the water was then *quite fresh*, I could ascertain nothing satisfactory. My informants were the Nakodas, or captains of His Highness the Imam's ships of war, who frequently navigate between Muscat and Zanzibar, consequently must pass about the spot the Clive met what I have related. The Arab captains were firm in their assertion in the particular of the fresh water, although they confessed that they had never tasted it. I did, as also the surgeon of the vessel, and, as I mentioned before, it did not vary in any way from ordinary sea-water.—*Journal of the Royal Asiatic Society*, No. 9—p. 198-200.

H. D.

IX.—*Special Report on the Statistics of the Four Collectorates of Dukhun, under the British Government.*

[In spelling Oriental words, the *a* is the *a* in *all,* the *u* as in *hut*; the rest have the usual English sound.]

The General Committee of the British Association which met at Cambridge in 1833, did me the honour to pass a resolution that I should prepare for publication my manuscripts respecting the Statistics of Dukhun (Deccan). I have been anxious to respond to so flattering a desire at an earlier period, but having placed my manuscripts in the hands of a distinguished person, as auxiliary to his scientific labours, I have been

deterred from reclaiming them until the objects for which they had been placed at his disposal were realized.

In responding at last to the call of the British Association, I feel very considerable embarrassment in adapting my materials to the space which can be afforded to me in its annual volume. The materials, in fact, are very voluminous; and the nature of my subject embracing multitudinous details, figured statements, and lengthened tables, makes it a work of no ordinary difficulty to digest, abridge, and condense them without involving my subject in obscurity, and exposing myself to the imputation of inefficient inquiry from the hiatus which must appear. I beg, therefore, distinctly to state, that the absence of information observable in the following Report, is attributable, not to paucity of matter, but to the want of a sufficient field in which to display it.

Extent and Physical Circumstances.

I propose to give but a meagre sketch of the statistics of Dukhun; a mere enumeration of its population, products, manufactures, revenues, civil divisions, &c., with little more comment than may be necessary to ensure perspicuity.

In the execution of my public duties as Statistical Reporter to the government of Bombay, my researches made me acquainted with the statistics of the four collectorates of Dukhun, denominated the Poona, Ahmednuggur, Candeish or Khandesh, and Dharwar Collectorates; facts were also collected respecting the territories of the Rajah of Sattarah, and some few details came to hand illustrative of the state of the possessions of the southern Mahratta Jagheerdars, which are under British protection. In adverting to the whole of these territories, although I shall name them separately in describing their extent, physical circumstances, and civil divisions, it will only be to notice where they differ from each other.

The whole of the above territories, containing 3,285,985 inhabitants, spread over 48,987 square miles, and averaging 67 inhabitants to the square mile, lie upon that elevated plateau, which has an abrupt termination on the western side of India, in what are usually denominated the Ghàts, but which plateau gradually declines, occasionally by a succession of low steps, as is seen by the courses of rivers to the Coromandel coast, excepting in Khandesh (Khind meaning a gap or trench, and Desh a country), where the river Tapty disembogues to the westward, from the peculiar configuration of the narrow valley in which this collectorate lies. Some of the platforms on the summit of the Ghàts have an elevation of 5000 feet above the sea, but the general level of the

main plateau of Dukhun is about 2000 feet high near the Ghàts, and scarcely exceeds 1000 feet in the eastern limits of the collectorates. The whole territory is mountainous near to the Ghàts, and has numerous valleys, some of them narrow and tortuous, others broad, open, and flat. At from thirty to fifty miles eastward from the Ghàts, most of the mountain spurs which produce the valleys terminate, and the country becomes open and tolerably level for considerable distances, with an occasional step down to the eastward; the country, in fact, being made up of beds of trap, the beds extending the further to the eastward the lower they are in the series. There is much forest and underwood and jungle along the line of the Ghàts; but to the eastward the country is open, and there is a want of wood; parts of Khandesh and Dharwar are exceptions to this description. The western tracts along the Ghàts are called the Mawuls, in contradistinction to the open country, which is called the Desh or Dès.

It may be as well to state here that all lands in Dukhun are classed within some village boundary or other, and this boundary is maintained with such jealousy and tenacity by the inhabitants, as to lead to frequent feuds and bloodshed on the slightest invasion of village rights. The village constitution and the occupancy of lands will be mentioned under land-tenures.

Rivers.—The rivers of Dukhun, which in the monsoon flow with a magnificent volume of water, in the hot season present a broad gravelly bed, with only a thread-like stream in many of them, but from natural barriers of rock in the bed of the Beema, Godavery, Kistnah, and other large rivers of Dukhun, extensive sheets of water, called Dho or Dhao, are formed, which abound with fish.

Roads and Bridges.—The roads in Dukhun, with the exception of two great military roads, are untouched by art; and few of the rivers can boast of a bridge.*

Climate.

A detailed account of the atmospheric tides, and meteorology of Dukhun having been published in the *Philosophical Transactions*, I shall limit myself to a description of such broad features as characterize the climate. The Ghàts and the Desh have distinct features. The tract along the line of the former has a lower mean temperature, much more

* The *Geology of the Deccan*, which follows in this place, was re-published by us from the *Transactions of the Geological Society of London*, in the 17th Number of this Journal, p. 344.—Editor, *Madras Journal.*

moisture, greater prevalence of westerly winds, a more limited range of the thermometer; but a greater prevalence of fogs before, during, and after the rains, but not in the winter months; and, finally, is characterized by the absence of hot winds. The Desh, on the contrary, has the air excessively dry in the hot months; a great diurnal and annual range of the thermometer, a comparatively small fall of rain in the monsoon, the frequent occurrence of hot winds, and the rareness of fogs.

Barometer.—The mean monthly pressure of the atmosphere is greatest in the winter months of December and January; it gradually diminishes until July or August, the most damp months, when it is at its minimum; it gradually increases again until the cold months. The greatest diurnal oscillation recorded by me in several years' observations was ·1950, or less than two-tenths of an inch; the smallest oscillation ·0150. The mean rise of the barometer from sunrise to 9—10 A. M. for three years was ·0445, thermometer + 7°·15′. The mean fall from 9—10 A. M. to 4—5 P. M., for four years, was ·1066, thermometer + 5°·21′; and the mean rise from 4—5 A. M. to 10—11 P. M., for one year, is ·0884, thermometer —7°·2′. The maximum range of the barometer at Poona, in the year 1830, at 1823 feet above the sea, was only ·672, or not seven-tenths of an inch. The mean height of the barometer for that year was 27°·9254, and the mean height in the monsoon was 27°·8447; so that the constant moisture of the monsoon only occasioned a mean diminution of pressure of ·0807, or less than one-tenth of an inch. At Madras, for twenty-one years, the mean height of the barometer was 29°·958′ inches; at Calcutta, the means of three years make it 29·764. M. Arago, at Paris, by nine years' observations, reduced to the level of the sea, makes the mean height 29·9546 inches, being almost identical with the mean height at Madras.

Atmospheric tides.—There are four tides of the atmosphere in Dukhun, as indicated by the movement of the barometer; two diurnal, and two nocturnal: the diurnal rising tide is from 4—5 A. M. to 9—10 A. M., and varies from ·0200 inches to ·0500 inches; the falling tide is from 9—10 A. M. to 4—5 P. M., and varies from ·1950 inches to ·0150 inches. The nocturnal rising tide is from 4—5 P. M. to 10—11 P. M., and varies from ·0450 inches to ·1140 inches; the nocturnal falling tide is from 10—11 P. M. to 4—5 A. M., and is about ·0442 inches. This order was never deranged or inverted in one single instance in many thousand observations.

Temperature.—The climate of Dukhun is subject to very considerable variations of temperature; more, however, in the diurnal than in the monthly or annual ranges; indeed, less so in the last particular than in Europe. In 1827, the extreme range of the thermometer at Edmonton

was 75° Fahrenheit; at Cheltenham, 64°·6. In St. Petersburgh, the thermometer has been as low as 35°·7′ *below zero*, and as high as 91°·4; the range, therefore, 127°·1. At Berne, the annual range has been more than 75°. In 1826, I observed a range of 53°·4, viz., from 93°·9 on the 12th March, to 40°·50 on the 15th January at sunrise. In 1827, the maximum range observed by me was 48°·8, viz., from 96°·8 on the 28th March, to 48° on the 12th December at sunrise. In 1828, the maximum occurred on the 7th May, being 101°, and the minimum was 56°, the range, therefore, 45°; but, for a very short time, the thermometer rose on the 7th May, between two and three o'clock, to 105°; and this was the more remarkable as I was then encamped on the edge of the Ghàts at the source of the Beema river, at an elevation of 3090 feet above the level of the sea. This instance of unusual height of the thermometer, however, is not confined to Dukhun, for we learn from M. Arago, that it has been higher than 101° Fahrenheit in the shade in Paris.

Monthly means.—The monthly *means* do not differ more than from 13° to 17° from each other. In 1826, the difference between the hottest month (May, 83°·28), and the coldest (January, 65° 90), was only 17°·38. And in 1829, March was the hottest month, and November the coldest, their difference of means being 13°·66.

Diurnal range.—The greatest diurnal range in 1826 was on the 5th March, being 37°·30, from 50°·5 to 87°·8. In 1827, it was 39°·5, on the 12th December, from 49°·5 to 89°. In 1828, it was 34°·8, on the 16th July, from 56° to 90°·8. In 1829, the maximum diurnal range was 37°·5 in December. The minimum diurnal range occurs in the monsoon months of June, July, August, and September; indeed, occasionally, on some days in those months, the mercury does not move at all.

Mean Temperature.—In 1828, Dr. Walker, at Ahmednuggur, at an elevation of 1900 feet above the sea, made the mean temperature 78°; and though I was living in tents, and moving about the country, I made it only 77°·93. Of course, on higher or lower levels this mean temperature will be diminished or increased. It is necessary, however, to note one remarkable fact, namely, that the mean temperature of places on the table-land of the continent of India is much higher than the calculated mean temperature of the *same* places agreeably to Mayer's formula. The calculated mean temperature of Ahmednuggur is 72°·27, observed 78°; of Poona 72°·78, observed 77°·7; of Mhow, in Malwa, 69°·86, observed 74°: temperature of a spring in the hill fort of Hurreechundurghur 69°·5, calculated temperature 65°·45.

The results of several years' observations indicate that the annual mean temperature of 9°·30 A. M., is nearly identical with the mean temperature deduced from the maxima and the minima.

With respect to the greatest diurnal, and the greatest monthly range of the thermometer, the winter months have a range nearly in a quadruple ratio to the monsoon months. The latter have mostly the temperature very equable, the difference of the monthly means rarely exceeding 3°, and the greatest diurnal range in five years only once amounted to 13°·6. The latter end of March, and April, and May are the hottest periods of the year, from the position of a nearly vertical sun, the intensity of whose influence is but slightly modified by the occasionally cloudy weather: the temperature falls in June, and continues nearly stationary until the end of September: it then rises in October, but falls at the end of the month, until its annual minimum in December or January. It is low the early part of March, but rises *suddenly* after the middle of the month, occasioning a difference of 6° or 8° between the means of February and March, which is more than double that of other consecutive months in the year. The rise in October is also sudden, but does not occasion so great a difference of means as between February and March. It will thus be remarked that the temperature does not follow the sun's declination, owing to the interference of the monsoon.

Moisture.—A remarkable feature in the climate of Dukhun is the small quantity of aqueous vapour generally suspended in the air, compared with the proximate climate of Bombay and the coast, or even the hilly tracts of the Ghàts. My observations were made with Daniell's hygrometer, and extended over several years. There is a gradual increase of moisture in a cubic foot of air, from the most dry month, February, until June and July. Hence the moisture remains nearly stationary until the beginning of October, when it diminishes somewhat rapidly and regularly until February. The annual mean dewing point is greater at 9½ A. M. than at sunrise or at 4 P. M., but this does not uniformly hold good in each month of the year. In 1826, the highest dewing point was at four o'clock on the 21st October, being 76°·, temperature of the air 84°·5, a cubic foot of air holding 9·945 grains of water. The lowest dewing point was on the 4th December, at sunrise, being 44°, temperature of the air 56°, a cubic foot of air containing 3·673 grains of aqueous vapour; but the lowest dewing point did not indicate the driest state of the atmosphere, as a dewing point of 45° in November, with a temperature of 87° at 4 P. M., gave only 3·587 grains.

The most moist month was July; the mean weight of water in a cubic foot of air was 8·775 grains, and the point of saturation was only 4°·85 from the dewing point. The greatest monthly range of the dewing point was, in October, 30°, and the smallest range, 7°, was in July and August. The monthly range was not coincident with the movements of

the barometer and thermometer; but there were curious approximations. The extreme dewing points differed 32°. The dewing point has been as high as 76°, temperature of the air 79°, a cubic foot of air containing 10·049 grains of aqueous vapour; but this is a rare occurrence. An instance occurred of the dewing point being obtained at 3° below the point of the congelation of water, the temperature of the air being 62°, and a cubic foot of air holding 2·146 grains of water. There is also an instance of a dewing point, in February, 1828, being 61° below the temperature of the air, viz., from 90° to 29°, but I never afterwards succeeded in determining anything like so great a depression.

In January, 1827, there was a range of the dewing point of 38°, and the extreme range of the year was 47°, viz., from 29°, temperature 62°, in January, to 76°, temperature 79°, in June. In 1829, the mean dewing point for the monsoon was 69°·62, temperature 75°·83; the cubic foot of air containing 8·191 grains of water. In 1830, the observations are only complete for 9—10 A. M.; the mean dewing point was 61°·9, temperature 78°·4, and a cubic foot of air contained 6·351 grains of water; the extreme range of the hygrometer was 47°, the lowest dewing point 31°, temperature 50°, in December. It might be supposed that the hottest months in the year, March, April, and May, would also be the driest; but such is not the fact. The powerful action of the sun on the ocean, in the middle of March, raises a large quantity of aqueous vapour, which continues to increase in the ratio of the sun's progress north: the westerly winds waft this vapour into Dukhun; much of it is arrested by the Ghàts and hilly tracts eastward of these mountains; accounting for the sensible moistness of the air, the frequent night fogs, and deposition of dew in this line, in the end of March, and in all April and May. The supply of moisture diminishes in proportion to the distance eastward from the sea, to the limits of the Coromandel coast monsoon. We in consequence find the Ghàts, Poona, Ahmednuggur, and the Bala Ghàt, all with very different dewing points in the hot months.

The hygrometric state of the air in Bombay and Dukhun is remarkably contrasted: in fact, there is more aqueous vapour suspended in the air in Bombay in the hot months, than there is at Poona at any time during the monsoon. In April and May, 1826, in Bombay, the monthly mean dewing points were respectively 72°·84 and 75°·59, temperature 83°·48 and 84°·52, a cubic foot of air holding 8·988 grains, and 9·743 grains of water suspended; whilst July, the most rainy month during the monsoon, at Poona, had only a mean of 8·775 grains of water suspended. In 1827, the means of ten days' observations in Bombay, in April, gave 10·243 grains of aqueous vapour in a cubic foot of air; and

the greatest mean quantity at Poona was in June, and it amounted only to 8·931 grains. In 1828, in the month of March, the following were the dewing points in consecutive days, travelling from Bombay to Poona: Bombay, 10th March, 4 P. M., 11·205 grains of water in a cubic foot of air; at Poona, at the same hour, on the 14th March, 2·273 grains. At Bombay, on the 10th, at sunrise, and at $9\frac{1}{2}$ A. M., the dewing points were respectively 72° and 71°, temperature 75° and 81°·5, a cubic foot of air containing 8·873 grains at the former hour, and 8·487 grains at the latter hour. The following morning at Kundallah, on the top of the Ghàts, 1744 feet above the sea, at the same hours, the dewing points were 36° and 40°, temperature 72° and 78°, equivalent only to 2·690 grains, and 3·004 grains of water in a cubic foot of air. In the afternoon of the same day, at Karleh, 2015 feet above the sea, seven miles east of Kundallah, a cubic foot of air held 2·954 grains, and on the 12th, at 4 P. M., 2·611 grains of aqueous vapour. On the summit of the hill fort of Loghur, 3381 feet above the sea, and 1366 above Karleh, the dewing point at sunrise on the 13th, was 5° Fahr. below the freezing point, temperature of the air 67°, and a cubic foot of air held only 1·995 grains of water in a state of vapour. These facts fully establish the remarkable discrepancies between the hygrometric state of the air in Bombay and Dukhun, and that too within a difference of a few miles of latitude and longitude. A comparison of the absolute falls of rain in Bombay and in Poona, for the years 8826-7-8, shows an agreement (to a certain extent) in their ratio to the hygrometric state of the air at Poona and Bombay, above noticed. The mean fall of rain at Bombay in those years was 93·62 inches, and at Poona 26·926 inches, or $28\frac{3}{4}$ per cent. only of the fall in Bombay.

Rain.—In Dukhun the rains are light, uncertain, and, in all years, barely sufficient for the wants of the husbandman, and a slight failure occasions much distress. They usually commence at the end of May, with some heavy thunder showers from E. to S. E., the lightning being terrific and frequently fatal, and the wind furious; but they do not set in regularly until the first ten days in June, and continue until the end of September from the W. to the S. W., and break up with thunder-storms from the E. to the S. E. before the middle of October. During the remaining months of the year an accidental shower or two may fall from the Coromandel monsoon; and the further the distance eastward from Poona, the greater the chance of showers in the cold months. The monsoon temperature is equable and agreeable, and the rain occurs almost always in showers, rarely continuing uninterruptedly for a day or more, as is common on the coast and in the Konkun. The greatest

quantity of rain falls in the months of June and July. The greatest fall of rain in any one day was 2·58 inches, on the 6th July, 1826; at Bombay, on the 24th June, 1828, there fell 8·67 inches; and at Hurnee, on the 15th June, 1829, there fell 8·133 inches in 24 hours.

The mean annual fall of rain for all England, from many years' observations, appears to be 32·2 inches, but the means of different counties vary from 67 inches in Cumberland to 19 inches in Essex.

The clouds supplying the monsoon rains in Dukhun would appear to have a low elevation, as I have frequently seen through breaks as they were passing swiftly from west to east, a superior stratum, apparently stationary, or moving slowly in a contrary direction, and gilded by the sun's rays.

Winds.—The great features in the observations respecting the winds, are the prevalence of winds from the west and westerly quarters, east and easterly quarters, and the extreme rareness of winds from the north and south, and the points approximating to them; and these features appear to be constant in successive years. In 5229 observations the wind blew from the west, or points adjoining, 2409 times; and in this number the S. W. (305), and N. W. (122), amount only to 427. From easterly points 949 times, including 246 from the N. E. and S. E., thus leaving 703 from the east. From the north 115 times, and from the south 36 times only. Another feature is the frequent absence of wind, particularly at sunrise, and more so in the months of January, February, March, October, and November than in other months of the year. The cessation of wind from May to September inclusive is comparatively rare; and, generally, throughout the year the absence of wind at 4 P. M., may be looked upon as unusual. In my records there are 1720 observations of "*No* wind," and 847 of these belong to sunrise, 452 to 9—10 A. M., and 304 only to 4 P. M.

The observations were continued through five years, three times daily; sunrise, 9—10 A. M., and 4 P. M. There is considerable uniformity in the direction of the wind in the same months in consecutive years. The westerly winds begin to *prevail* in March, alternating with easterly winds, which blow the latter part of the night; but the easterly winds disappear as the monsoon approaches, and do not re-appear again till October. In October the winds are variable, and the records of "No wind," increase suddenly and rapidly. A few easterly winds, however, about the end of the month, indicate the change which is to take place; they gradually increase, and with those from the N. E. and S. E., almost entirely supersede the winds from the westerly points during the cold months.

In March, from the sun's approach, the interior land during the day gets heated; an influx of air from the sea coast commences daily after 10 A. M.; but as the earth, at this period, cools more rapidly than the sea at night, the interior is cooler than the coasts, and there is a reflux of air towards the ocean; the easterly and westerly winds thus alternate day and night. This alternation, however, diminishes in the ratio of the sun's increasing power; and when the earth gets so thoroughly heated that it cannot reduce its temperature by radiation below that of the sea, the consequence is the prevalence of winds from the westerly points to the almost entire exclusion of those from easterly points. In June the westerly winds set in regularly. There are occasional instances of the wind blowing with much steady violence from the west for many hours in the hot months with a sunny sky. In the early part of March some unaccountably cold winds, affecting vegetation even, have been known to blow.

Hot Winds.—The well-known hot winds of tropical continents do not prevail near the Ghàts; but the same wind, which is pleasant in their neighbourhood, may become a hot wind as it travels to Ahmednuggur and Arungabad. The east wind is characterized by its extreme dryness, and it is dangerous to sleep exposed to it.

Whirlwinds.—Those curious whirlwinds noticed by travellers in Africa, and which in the deserts are dangerous, are of common occurrence in Dukhun in the hot months. A score or more columns of dust, in the form of a speaking trumpet or water-spout, may be seen rapidly coursing over the treeless plains, marking a vortex of heated air. They are sufficiently powerful to unroof a thatched house, strike tents, and whisk away all light matters.

Hail Stones.—Hail stones of considerable magnitude sometimes fall in the thunder-storms of the hot months.

Dews.—Dews appear plentifully after the monsoon, and during the nights of the cold months; but their frequent local occurrence has often excited surprise.

Fogs.—Fogs are of so rare occurrence in the Desh, or country eastward of the Ghàts, that I have only nineteen records of them during five years. Along the Ghàts they are much more common; and during April and May, for three or four nights in the week, fogs drift rapidly to the eastward from the Konkun, or low country at the foot of the Ghàts. On some nights no drift takes place, and the fog remains resting on the Konkun; and, seen from the crest of the Ghàts at sunrise, has the appearance of a sea of milk. As the sun rises the fog creeps up the chasms of the Ghàts, and finally disappears by 10 A. M.

Salubrity of the Climate.—With respect to the salubrity of the open parts of the country, it will only be necessary to state that, in my little camp, consisting of more than a hundred souls (natives), I had not a single death of an adult during 6 years ; nor a case of illness (excepting one) that I did not cure without regular medical aid. Dr. Walker, long civil surgeon in the city of Ahmednuggur, found the casualties in 1828 in that city (exclusive of losses from spasmodic cholera) to be only 1·82 per cent., or 1 in 55·1 persons ; and, including cholera, 2·48 per cent., or 1 in 40·2 persons. Dr. Lawrence, in charge of a regiment of natives 1,000 strong, lost only 0·85 parts of an integer per cent., per annum, or about 5 men in 600 during the years the regiment was in Dukhun.

Parts of Khandesh have not credit from the same salubrity.

Botany.

Under this head I shall confine myself to a simple enumeration of the agricultural and garden products, and wild fruits. To enter into the botany of Dukhun generally would be misplaced in this digest. And first with regard to cultivated native fruits ; there are forty-five in number, viz.

Cultivated Fruits.—Amba, *Mangifera indica* [a] ; Oombur, *Ficus glomerata* ; Phunnus, *Artocarpus integrifolia* [b] ; Cheents, *Tamarindus indica* [c] ; Ambarra, *spondias Mangifera* [d] ; Hurparewree, *Cicca disticha* ; Ramphal, *Annona reticulata* [e] ; Seetaphul, *Annona squamosa* ; Raeebor, *Zizyphus jujuba* ; Jamblee, *Calyptranthes caryophyllifolia* ; Awlee, *Phyllanthus emblica* ; Bail, *Ægle Marmelos* [f] ; Wowulee, *Mimusops elengi* ; Narlee, *Cocos nucifera* [g] ; Jamb, *Eugenia Jambos* [h] ; Mohha, *Bassia latifolia* ; Toot, *Morus alba* [i] ; Shatoot, *Morus indica* [k] ; Choonchoo, *Morus*——— [l] ; Kurumbul, *Averrhoa Carambola* [m] ; Kuweet, *Feronia elephantum* [n] ; Bhokur, *Cordia latifolia* ; Anjeer, *Ficus Carica* [o] ; Daleemb, *Punica granatum*, (two kinds) [p] ; Weer, *Citrus limon* [q] ; Chukotur, *Citrus decumanus* [r] ; Maloong, *Citrus medica* [s] ; Nareeng, *Citrus aurantium* [t] ; of these there are several kinds ; Ambut neemboo, *Citrus acida* [u] ; Sakur neemboo, *Citrus limon* var. [x] ; Peroo, *Psidium Pyriferum* [y] ; Peroo tambra, Red Guava ; Kajoo, *Anacardium occiden-*

a Mango. b Jack fruit. c Tamarind. d Hog-plum.
e Sweep-sop. f Bengal quince. g Cocoa nut. h Rose apple.
i White mulberry. k Red mulberry. l Small mulberry. m Coun. gooseberry
n Wood apple. o The garden fig. p Pomegranate. q Lemon.
r Shadock. s Citron. t Orange. u Lime.
x Sweet lime. y Guava.

tale [a]; Gondnea, *Cordia myxa;* Tarh, *Borassus flabelliformis;* Phopy, *Pupeea Carica;* Badam, *Terminalia catappa;* Sooparee, *Areca faufel* [b]; Kujoor, *Phœnix dactilifera* [c]; Kel or Kail, *Musa paradisiaca* [d], there are several species or varieties. Sonkel, *Musa sapientum;* Draxhs, *Vitis Vinifera* [e]. There are seven species of grapes in Dukhun, the Mahratta names of which are Kalee, or black; Ahbee, or watery; Phukree, or Muscadina; Saheebee, Bedana, or seedless; Sooltanee; and Suckree, or sugary. Khurbooz, *Cucumis Melo* [f]; Phoot, *Cucumis momordica;* and Kulungrah, *Cucurbita Citrullus* [g]. There are several species or varieties of the melon.

Wild Fruits.—The wild fruits are twenty-two in number, viz. Beebah, *Semicarpus anacardium* [h]; Cher, *Chirongia sapida;* Ratambee, *Garcinia*——— [i]; Torun, *Zizyphus albens;* Kurwund, *Carissa Carandas* and *diffusa*, both of them excellent fruits; Seendee, *Phœnix Sylvestris*, or *Elate Sylvestris* [j]; Jungle Jaeephul, *Myristica dactyloides* [k]; Peempree, *Ficus comosa;* Rahbor, *Zizyphus Xylopyrus*; Bunkeil, *Musa troglodytarum*, [l] two varieties; Gooloom, *Loranthus bicolor;* Lotowl, a genus and species not determined; Ambgoolee, *Elæagnus*———, a very nice fruit, tasting like a gooseberry. Ulloo, *Vanqueria spinosa;* Temboornee, *Gardenia*, ——— ; Thurtee, *Capparis erythrocarpus*; Neptee, *Capparis aphylla;* Wagatee, *Capparis Zeylanica;* Makur Neembonee, *Citrus*——— [m]; Wuhr, *Ficus Indica;* Loheer, *Ficus*———, a noble tree, 80 to 100 feet high.

The above comprise the wild fruits of Dukhun; many of them are not only passable, but very palatable, particularly the Ambgoolee, the Kurwund, and the Char. The Ratambee, or wild mangostein, is in extensive use as an acid seasoner, and is met with for sale in most markets in a dried state. The wild nutmeg is frequently imposed upon the ignorant for the real nutmeg. The oil of the Beebah is used for marking linen, like indelible ink; but the kernel roasted is agreeable. The wild lime *(Citrus)* is only met with in the Ghàts; it forms a handsome dense tree, but the cultivated fruit is so abundant that the wild is not made any use of. Many of the above fruit trees produce good timber. With respect to the mango, which is met with both cultivated and wild, it is considered by the people less as a luxury, than as an auxiliary to the necessaries of life, or as a substitute for them in seasons of scarcity; for the

a Cashew nut. b Beetle nut. c Date. d Plantain. e Grapes. f Musk melon. g Water melon. h The marking nut. i The wild mangostein j Wild date. k Wild nutmeg, l Wild plantain. m The original apparently of some of the species of *Citrus* in Dukhun.

mango is in fruit, and seldom fails an abundant crop, at a time when the earth is parched up by the heats of May and beginning of June.

Agricultural Products.—A brief notice only of the agricultural products can be given. The harvests are of two distinct kinds; one is the Khurreef, or rainy season harvest; the other is the Rubee, or dry, or cold, or spring season, harvest.

Wet Season Harvest.—This harvest produces twenty-two kinds of grain and pulse; but the products of the Desh, or open country, are different from those of the Mawuls, or hilly tracts along the Ghàts. The following are the products of the monsoon crop in the Desh: Jondla, *Andropogon Sorghum*, and of these there are many varieties; Sujgoora, *Panicum spicatum*; Rahleh, *Panicum Italicum;* Bhadlee, *Paspalum pilosum*; Kodroo, *Paspalum frumentaceum;* Mukka, *Zea Mays* [a]; Moog, *Phaseolus Mungo*, Ooreed, *Phaseolus radiatus;* Tooree, *Cytisus cajan;* Muht, *Phaseolus aconitifolius;* Teel, *Sesamum orientale*, two kinds; Ambaree, *Hibiscus Cannabinus;* Oolgeea, *Dolichos bifloris*; Waal, *Dolichos spicatus;* Rajgeerah, *Amaranthus oleraceus candidus;* Chuwluya, *Dolichos catiang;* and Gowarya, *Dolichos fabæformis:* there are thus seventeen products of the monsoon harvest of the Desh. The first six are bread grains, and are reduced to flour; Teel and Rajgeerah are eaten unground; Ambaree is a cordage plant, the rest are pulse, and are cooked in a variety of ways. Tooree is the universal substitute for the split pea of Europe; it is much more agreeable than the pea, and is more commonly used.

The produce of the rainy season harvest in the hilly tracts is Dhan, *Oryza sativa*, [b] seventeen or eighteen kinds; Natchnee, *Eleusine coracana*, or *Cynosurus coracanus;* Sawa, *Panicum miliaceum;* Wuree, *Panicum miliare;* and, finally, Karleh, *Verbesina sativa.* All these require a superabundance of water. The rice, which is the chief support of the people of the hilly tracts, is sown in the valleys, because it can be constantly flooded. Karleh is an oil plant only; the others are sown on the sides of the mountains, in places inaccessible to the plough. They are either used whole, or are reduced to flour for bread. Rice is never reduced to flour.

It is not to be understood, that the above products, as separated into those of the hilly tracts and Desh, are rigidly confined to those tracts; where the physical circumstances permit of it, they are indiscriminately cultivated in both tracts. The returns of some of the above plants are prodigiously great. I have seen a plant of *Paspalum frumentaceum*

a Indian corn. b Rice.

with twenty stalks radiating from a common root, and with thirty-three spikes of grain, giving the astonishing return of 61,380 for 1 ; a single head of *Andropogon Sorghum* gave 2895 for 1 ; eight stalks of *Panicum spicatum* from a single root 16,960 for 1 ; and a single head of *Panicum Italicum* produced 1850 for 1 ! !

Dry or Spring Season Harvest.—The next harvest is that of the Rubee, or dry or spring season of the Desh. In this harvest, of twenty-three products, there are four species of fine wheat, viz. Guhoo Bukshee, *Triticum spelta*; Kupleh Guhoo, *Triticum* ——— ; Kateh Guhoo, *Triticum* ——— ; and Pohteeyai, *Triticum* ———, called bellied wheat, from the seed being very much swelled out in the middle. Urburee, *Cicer Arietinum* ; Shaloo, *Andropogon saccharatum* ; Juw, *Hordeum hexastichon* [a] : Watanah, *Pisum sativum* [b] ; Kurdee, *Carthamus Persicus* ; Juwus, *Linum usitatissimum* ; Mohuree, *Sinapis racemosa*, and two other kinds ; Taag, *Crotolarea juncea* ; Yerund Tambra, *Ricinus communis* [c] ; Yerund Eerwa, *Ricinus viridis* ; Oos Tambra, *Saccharum officinarum* [d] ; Oos Poonda, *Saccharum* ——— [e] ; Oos Pandra, *Saccharum* ——— [f] ; Oos Bèt, *Saccharum*, ——— [g] ; Shet Wallook, *Cucumis* ———, the literal meaning is field cucumber ; Pawteh, *Dolichos* ——— ; Tumbakoo, *Nicotiana tabacam*; Shet Kapoos, *Gossypium herbaceum* [h] ; Bhoeemoong, *Arachis hypogæa.* [i]

The above are chiefly produced in the Desh, in the dry season. Urburee, *Cicer arietinum*, is the universal substitute for oats for horses; and, excepting in the rains when green grass is obtainable, the juicy, sweet, and nutritious stalks of the Shaloo, *Andropogon sorghum*, and varieties, is their only forage. Oil is expressed from the seeds of Kurdee, Juwus, Mohuree, and Yerand. Juwus is not used for its flax. Although there are four kinds of sugar-cane, and much raw sugar is produced, the processes of refining are not carried on. The bark of Taag is used for ropes and coarse canvas. The returns from the wheat are very considerable ; I have a specimen of Kupleh Guhoo, with twenty-five stalks from one root, giving a return of 1450 for 1 ; ten stalks are very common ; a specimen of the Kateh Guhoo, also in my possession, with fifteen stalks from a single root, giving a return of 480 for 1. The average on tolerable land is eight stalks or ears to a plant. The tobacco from some parts of the country is reckoned very fine.

The dry season harvest of the hilly tracts is almost entirely confined to Mussoor, *Ervum hirsutum* ; and Pawta, a variety of *Dolichos Lablab.*

a Barley. b Peas. c Castor oil. d Red sugar cane.
e Variegated sugar cane. f White sugar cane. g Reed-like sugar cane.
h Field cotton. i The earth nut.

Garden produce.—The produce of the gardens is of great importance to the natives of India, from their poverty limiting them very much to a vegetable diet, corrected by aromatic seeds and condiments. Most of the plants cultivated in the gardens of the Desh are also produced in the gardens, where they exist, (which is rarely) of the hilly tracts. The products are forty-six in number, viz., Dhunya, *Coriandrum sativum*[a] ; Mehtee, *Trigonella fœnugrecum ;* Shepoo, *Anethum sowa ;* Bureeshep, *Anethum fœniculum* [b]; Wowa, *Ligusticum agivaen ;* Hulwee, *Lepidum sativum ;* Meerchya, *Capsicum annuum* [c] ; of this there are many species. Patee, *Allium cepa,* [d] red, white, and yellow ; some of which are so mild as to be used as vegetables. Chakweet, *Chenopodium album ;* Chooka, *Rumex Vesicarius* [e] ; Wahlea, *Basella rubra* and *alba ;* Aaloo, *Arum campanulatum ;* Tandoolja, *Amaranthus polygamus ;* Maat Tambree, *Amaranthus oleraceus,* var. ; Paluk, *Beta Bengalensis ;* Mohtee gohl, *Oxalis monadelphus ;* Gohl, *Portulaca oleracea ;* Pokulla, *Amaranthus,* —— ; Poodna, *Mentha viridis ;* Chundun Butwa, *Chenopodium,* —— ; Bhang, *Cannabis sativa* [f] ; and Nagwail, *Piper Betel.* The most valuable of the above plants produce aromatic or pungent seeds ; most of the rest are pot-herbs held in considerable estimation.

Edible roots.—The next division of garden produce is denominated Mool Bojee, which literally means "root-greens," properly edible roots. Mooleh, *Raphanus sativus* [g] ; Rutalee, *Convolvulus batatas* [h] ; Kohn, *Dioscorea purpurea* or *alata* [i] ; Gajur, *Daucus carota* [j] ; Lussoon, *Allium sativum* [k] ; Soorun, *Arum,* —— ; Rungeh, *Dioscorea fasciculata ;* Alluh, *Amomum Zingiber* [l] .

Fruit vegetables.—A further division is made of Phul bajee or fruit greens, which means fruits eaten as vegetables, viz., Bhendee, *Hibiscus esculentus ;* Wangee, *Solanum melongena,* [m] several species or varieties ; Gewree, *Dolichos,* —— ; the seeds are eaten as pulse, and there are several varieties ; Dorkee, *Cucumis acutangulus ;* Gosaled, *Luffa pentandria ;* Karlee, *Momordica Charantia ;* Tondlee, *Momordica monadelphia ;* Purwal, *Trichosanthes anguina ;* Purwar, *Trichosanthes cucumerina ;* Turkakree, *Cucumis usitatissimus ;* [n] Kateh Wallook, *Cucumis sativus,* warty, prickly cucumber ; Doodh Boplah, *Cucurbita longa ;* Boplah-tambra, *Cucurbita Pepo,* red pumpkin ; specimens of this fruit are sometimes more than eighteen inches in diameter ; Kohwall, *Cucurbita alba ;* Dhendsee, *Cucurbita,* —— ; Kasee Boplah, *Cucurbita lagenaria.*

a Coriander. b Sweet fennel. c Chilly. d Onions.
e Blister sorrel. f Hemp. g Radishes. h Sweet potatoes.
i Yam. j Carrots. k Garlic. l Ginger m Egg plant.
n Common cucumber.

Such are the cultivated garden products of the natives: it will be seen that they are rich in the cucurbitaceous family, and not less so in the aromatic and pungent plants; and the edible roots are various. Edible leaves, used as greens, are very numerous, particularly those produced spontaneously. My limits do not permit me to give even the names of wild plants producing greens, fruits used as vegetables, or edible roots; the flowers of some plants are used as greens; such as the Angustee, *Æschynomene grandiflora*; the Shewga, *Hyperanthera morunga*, or horse-radish tree; and those of the Kanchun, *Bauhinia purpurea*; the foot-stalks of the flowers of the splendid *Convolvulus candicans* are used in a similar way. The tender twigs of the common bamboo are good as greens, and they are also made into a pickle. The flower, stalks, and roots of the Lotus *(Nympha esculenta)* are reckoned fine; but I must stop.

Grasses.—The grasses are innumerable, and are not less distinguished for their beauty than their variety. One of the most common is that highly nourishing grass the *Agrostis linearis*, which, it appears, is a native of Cornwall, under the name of *Panicon dactylon.* In biting the knots or joints of the Ghateea *(Andropogon Martini ?)* there is a strong, pungent, aromatic, and oleaginous exudation. The well-known aromatic Khus Khus *(Andropogon muricatus)* is abundant in Dukhun, as well as the sacred grass Durb, *Poa cynosuroides.* In speaking of the grasses it may be as well to say that it is not the practice of the natives to make hay from meadows; they allow the grass on waste lands to become perfectly dry, and then cut it down with the sickle, as a substitute for hay.

Wild cordage plants.—The spontaneous cordage plants are the Gayal, *Agave vivipara*; the Kaswuree, *Sida patens*; and some others.

Wild oil plants.—The wild oil plants are the Kurunj, *Galedupa arborea*; and the Kurd Kangonee, a small tree of the class and order *Pentandria monogynia.*

Wild tanning plants.—The plants used in preparing leather are the Chambar Heerda, *Terminalia Chebula*; Rahn Turwur, *Cassia auriculata*; the Sadrah or Aaeen, *Terminalia alata glabra*; and the Baubul, *Mimosa arabica*, the bark of which is in great repute.

Medicinal plants.—The medicinal plants are numerous. Amongst the most useful are the Khyr, *Mimosa catechu*; the Seegeekaee, *Mimosa abstergens*; many species of *Datura*; Kuntuh Kareeka, *Solanum jacquini*; Sagurgotta, *Cœsalpinia bonduccella*; Korpur, *Aloe succotrina*; Dadmaree, *Euphorbia tiruculli*; Gooleea Eendrawun, *Cucumis colocynthis*; Reeta, *Sapindus detergens*; Sahl Phul, *Boswellia thurifera*; Bawcheea, *Psoralea corylifolia*; some of the *Ocimums*, and many of the *Asclepias*

family. Of the powerfully scented plants, the *Michelia Champaca,* (Champa), *Pandanus odoratissimus,* several species of Jasmine, Polyanthus, Rose, &c., abound.

European fruits.—Very few of the European fruits are cultivated in Dukhun : indeed, those produced are almost confined to peaches and strawberries, both of which are as fine as in Europe. All the European vegetables thrive, such as cauliflowers, cabbages, asparagus, spinach, and broccoli. Potatoes, when properly attended to, are also good. Carrots, turnips, and radishes are indigenous.

Flowering plants.—It is not within my present view to attempt an enumeration of the wild flowering plants of Dukhun, many of which are splendid and curious. Nothing can exceed the magnificence and beauty of the vegetation in the Ghàts during the monsoon. The brilliancy of the *Erythrinæ,* the *Cassiæ* (particularly the *Cassia fistularia,*) the lofty *Bombax,* the varieties of the *Liliaceæ, Cannæ, Convolvulaceæ,* and *Malvaceæ,* would surprise and delight a European florist.

In the Desh, the dwarf *Cassia auriculata,* with its numerous yellow flowers, enlivens the whole country; and the numerous species of *Mimosa* (particularly the *Mimosa odoratissima*), perfume the air.

The Dukhun produces few ferns and no heaths, and none of the coniferous family, excepting *Cupressus ;* the Musci (true mosses) are rare; there are many of the *Euphorbiaceæ ;* no oaks, elms, or hazels, or indeed any of the *Amentaceæ,* excepting *Salix tetrasperma ;* multiplied genera and species of the *Jasmineæ, Labiatæ, Compositæ, Umbelliferæ, Leguminosæ,* and *Cucurbitaceæ ;* the *Cruciferæ* are not abundant; but the *Capparides* are very much so. The rosaceous plants are rare; but the *Solanaceæ (Luridæ)* are very abundant; although the potatoe is not indigenous.

Such is the meagre sketch of the botany of Dukhun ; for the elaboration of which there are abundant materials at the India House, in a Hortus Siccus collected by myself.

I must not omit to notice that the Sandal-wood tree, *Santalum album,* is met with, both in the cultivated and wild state.

Timber trees.—The Warsa, *Bignonia quadrilocularis ;* the Tamarind, *Tamarindus Indica ;* the Jack, *Artocarpus integrifolia ;* and the *Bauhineæ,* produce excellent wood for furniture ; and all the species of *Mimosa* furnish hard durable wood for tools and machinery.

Zoology.

Like the account of the botany, the zoology must be confined to little more than a mere catalogue of the beasts and birds of the country.

The inhabitants of Dukhun have the Georgian form of skull: their stature is low, but not very slender; the colour of the skin is brown, with shades running into yellow and white in the higher classes, and black in the lower; the females are not distinguished for beauty or fertility, the average number of births to a marriage being less than in Europe; more males are born than females, and, unlike Europe, they preponderate through all periods of life.

Quadrumana.—Of the monkey tribe I met with only two kinds, *Semnopithecus Entellus* and *Macacus radiatus.* A new species described by me, *Cercopithecus albogularis*, was not from Dukhun.

Cheiroptera.—Three species of bats, Wurbagool, *Pteropus medius; Nyctinomus plicatus;* and *Rhinolphus Dukhunensis.*

Plantigrada.—Chuchoondur, *Sorex Indicus*, or musk-rat; Aswail, *Ursus labiatus*, or labiated bear; Juhl Manjur, *Lutra Nair*, otter.

Digitigrada.—Of these animals, the first is the Kolsun or wild dog, *Canis Dukhunensis*, which was first described and brought to Europe by myself; Landguh, *Canis pallipes*, wolf, a new species; Kholah, *Canis aureus*, jackal; Kokree, *Canis Kokree*, a new species of fox; of the *Viveridæ*, the Juwadee Manjur, *Viverra Indica* or civet cat of Dukhun; Moongus, *Herpestes griseus*, Mungoose; Ood, *Paradoxurus Typus*. The *Hyæna*, *Turrus* of the Mahrattas, *Hyæna vulgaris*, is common in Dukhun, and is capable of domestication like a dog. The *Felinidæ* are numerous, not only in individuals, but in species, excepting the lion, which is not met with. Puttite Wagh, *Felis tigris*, royal tiger; Cheeta, *Felis leopardus* or genuine leopard, is rare; but the Beebeea Wagh, or panther, *Felis Panthar*, is most abundant. Cheeta, *Felis jubata*, or hunting leopard, is common. Mota Rahn Manjur, *Felis chaus;* Lhan Rahn Manjur, *Felis torquatus*, or lesser wild cat; the preceding being considered the larger wild cat. The species of the genus *Felis* here terminate. Of the rat family there is the Ghoos, *Mus giganteus*, or Bandikoot rat; Chooa, *Mus decumanus*, or Norway rat; *Mus musculus*, the mouse; and a very pretty field mouse of a bright chesnut colour, which is a new *Mus oleraceus*, also a second new mouse, *Mus platythrix.* Of the squirrel family there are only two species; the first, a splendid animal as large as the *Sciurus maximus*, of a chesnut colour, with a whitish tail; I have called it *Sciurus Elphinstonii*, the Mahratta name is Shekroo: the other species is the Khurree, or *Sciurus palmarum.* The porcupine, Sayal, is a new species, which I have called *Hystrix leucurus.* The hare, Sussuh, which abounds in Dukhun, is the *Lepus nigricollis* of F. Cuvier. That very curious animal, the Pangolin, *Manis crassicaudata*, is common: the Mahrattas call it Kuwlee Manjur, or tiled cat, the scales being im-

bricated as tiles on the roof of a house. The Dookur, or wild hog, *Sus scrofa,* abounds: every village also has a number of tame hogs, which are the public scavengers, but all property in them is abjured by the inhabitants. The Dukhun is celebrated for a breed of fine horses with a dash of the Arabian blood in them : the pony also is bred to a great extent to carry baggage. The Ass, Gudha, *Equus asinus,* is not much larger then a good-sized Newfoundland dog ; it is not met with in the wild state.

Ruminantia.—The Dromedary, Oont, *Camelus dromedarius,* is rarely bred in Dukhun, but is in general use; the two-humped camel is unknown. Of the other Ruminants, the first is a beautiful little creature called Peesoreh, *Moschus memina;* the next is the Sambur, *Cervus equinus,* of the size of a small cow ; the third is the Baikur, *Cervus muntjak:* all the above are inhabitants of dense woods. Of the antelopes there are four species ; Bahmunee Hurn, *Antilope cervicapra;* Kalesepee, or black tail, a new species, *Antilope Bennetti; Antilope quadricornis;* and finally, the Rooee, *Antilope picta,* or Nylgau: the two former are only found on the open plains; the two latter prefer the woods, but are sometimes seen on the plains. Goats, Bukree, *Capra hircus,* abound ; and sheep are so extensively bred in Dukhun, that flocks of many thousands are constantly met with grazing on the uncultivated lands; the wool is coarse and crisp; the price of a sheep is from two to four shillings; they afford excellent, although small mutton. The Pohl is the Brahmany bull, with its remarkable hump, *Bos taurus* var. *Indicus,* and is a noble animal ; when put into the yoke, or when employed in carrying loads, he is called Byhl, and he loses his hump and his fine appearance. The cow does not yield much milk. Cattle are extensively bred, as it is chiefly by their means the transit of merchandize is effected. The female buffalo, Muhees, *Bos bubalus,* is highly valued for the quantity of milk she gives. The male, called Tondgah, is used in the hilly tracts in ploughing the muddy fields for rice. The above is the catalogue of the *Mammalia* of Dukhun, and a few comments will suffice respecting it. The musk-rat is a pest, from its infecting with its nauseous odour everything with which it comes into contact, even a bottle of wine, although corked. The bear is harmless. The wild-dog hunts in troops in the woods, and runs down the fleetest of the ruminants. The wolves sometimes attack women and children, but never men. The jackals are in large troops, and do much damage in the vineyards. The fox is mostly solitary or in pairs. The moongus is useful in destroying snakes. The hyæna is cowardly, entirely nocturnal in his movements, and never attacks live animals. The royal tiger and the leopard are formidable to

man and beast; but the people consider themselves safe against the attacks of the panther and smaller cats, when armed with a good stout stick. The *Mus giganteus* undermines buildings. Of the rest of the wild animals it is not necessary to say more, than that they, like those just enumerated, are most of them objects of the chase with the Mahrattas, who are capital horsemen, and many of them keen sportsmen.

Birds.—The birds are very numerous; many of them not less useful to man, than agreeable from their plumage. Song-birds are, however, rare. My catalogue contains 232 species of the several orders, families, and genera.

Raptores.—There are 13 genera of the first order Raptores,—*Vultur Indicus, Vultur Ponticerianus, Vultur Bengalensis, Neophron Percnopterus, Haliaëtus Ponticerianus, Circaëtus brachydactylus, Aquila chrysaëta, Aquila bifasciata, Hæmatornus Bacha, Accipiter Dukhunensis, Accipiter Dussumieri, Astur Hyder, Falco Tinnunculus, Falco Chicquera, Circus pallidus, Circus variegatus, Milvus Govinda, Otus Bengalensis, Strix Javanica, Strix Indranee, Ketupa Leschenaulti,* and *Noctua Indica.* Of the above order there are two new *Accipiters,* one new species of *Circus,* one *Milvus,* and a *Strix.* The *Neophron* is the Ractamah of Bruce, the sacred vulture of the Egyptians, and it is a most useful scavenger, removing all offal matters. The golden eagle is the same as that of Europe, and so is the *Falco Tinnunculus;* and the harriers are scarcely distinguishable from the European birds. The falcons, hawks, and goshawks, are used by the natives in hawking.

Insessores.—There are 53 genera, and 116 species of the order *Insessores.* Few or none of these can be said to be useful to man, and only two of the species are songsters:—*Merops viridis, Hirundo filifera, Hirundo Jewan, Hirundo concolor, Hirundo erythropygia, Cypselus affinis, Caprimulgus monticulus, Caprimulgus Asiaticus, Caprimulgus Mahrattensis, Halcyon Smyrnensis, Alcedo rudis, Alcedo Bengalensis, Ceyx tridactyla, Muscipeta Paradisi, Muscipeta Indica, Muscipeta flammea, Muscipeta peregrina, Muscicapa melanops, Muscicapa Banyamus, Muscicapa Poonensis, Muscicapa cæruleocephala, Muscicapa picata, Rhipidura albofrontata, Rhipidura fuscoventris, Dicrurus Balicassius, Dicrurus cærulescens, Hypsipetus Ganeesa, Collurio Lahtora, Collurio erythronotus, Collurio Hardwickii, Lanius Muscicapoides, Graucalus Papuensis, Ceblepyris fimbriatus, Ceblepyris canus, Oriolus galbula, Oriolus melanocephalus, Oriolus Kundoo, Turdus macrourus, Turdus Saularis, Turdus cyanotus, Petrocincla Pandoo, Petrocincla Maal, Petrocincla cinclorhyncha, Timalia Malcolmi, Timalia Somervillei, Timalia Chataræa, Ixos jocosus, Ixos ca-*

fer, Ixos fulicatus, Pomatorhinus Horsfieldii, Iora Tiphia, Sylvia montana, Sylvia sylviella, Sylvia Rama, Prinia socialis, Prinia inornata, Orthotomus Bennettii, Orthotomus Lingoo, Budytes citreola, Budytes melanocephala, Budytes Beema, Motacilla variegata, Motacilla Dukhunensis, Megalurus ruficeps, Anthus agilis, Saxicola rubicola, Saxicola bicolor, Saxicola rubeculoides, Saxicola erythropygia, Phœnicura atrata, Phœnicura Sueciea, Parus atriceps, Parus xanthogenys, Alauda Gulgula, Alauda Deva, Alauda Dukhunensis, Mirafra phœnicura, Emberiza melanocephala, Emberiza hortulana, Emberiza cristata, Emberiza subcristata, Linaria Amandava, Ploceus Philippensis, Ploceus flavicollis, Fringilla crucigera, Lonchura nisoria, Lonchura cheet, Lonchura leuconota, Passer domesticus, Pastor tristis, Pastor Mahrattensis, Pastor roseus, Pastor Pagodarum, Corvus culminatus, Corvus splendens, Coracias Indica, Buceros, several species, *Palæornis torquatus, Palæornis melanorhynchus, Bucco Philippensis, Bucco caniceps, Picus Mahrattensis, Upupa minor, Leptosomus Afer, Eudynamys orientalis, Cuculus canorus, Cuculus fugax, Centropus Philippensis, Chloropsis aurifrons, Cinnyris lepida, Cinnyris currucaria, Cinnyris Vigorsii, Cinnyris minima, Cinnyris Mahrattensis,* and finally, *Cinnyris concolor.* The above catalogue requires very few observations. The weaver-bird, *Ploceus Philippensis,* is remarkable for its pendent nest, woven in the most curious and ingenious manner from fibres of grass. Not less curious are the nests produced by the tailor-birds, the *Prinia socialis* and the *Orthotomus Bennettii,* which sew leaves together to inclose their nests, with the skill of a veritable knight of the thimble. The lark, *Alauda Gulgula,* has the habits and delightful song of the skylark of Europe; and two or three species of the genera *Budytes* and *Motacilla* have sweet notes: the *Collurio Lahtora* has also a sweet note. The *Muscipeta Paradisa* and *Indica* are distinguished for their beautifully elongated tail-feathers. The *Coracias Indica* is characterized by its splendid colouring; and not less so is the *Cinnyris Vigorsii.* The cuckoo is the identical bird of Europe, and so is the sparrow. In the above list I have named many new species of *Insessores,* and have introduced one new genus.

Rasores.—That order so highly useful to man, the *Rasores,* does not contain one single species in Dukhun that is not valuable as an article of food. There are 12 genera and 40 species. *Ptilinopus Elphinstonii, Columba mœna, Columba tigrina, Columba humilis, Columba rasoria, Columba Cambayensis, Columba Ænas, Meleagris Gallopavo, Pavo cristatus, Gallus giganteus, Gallus Sonneratii, Gallus domesticus, Gallus morio, Gallus crispus, Numida Meleagris, Coturnix dactylisonans, Cotur-*

nix textilis, Coturnix Argoondah, Coturnix Pentah, Coturnix erythrorhyncha, Perdix picta, Francolinus Pondicerianus, Francolinus spadiceus, Pterocles exustus, Pterocles quadricinctus, Hemipodius pugnax, Hemipodius Taigoor, Hemipodius Dussumier, Otis nigriceps, and *Otis fulva.* Of the above, turkeys and guinea fowls are not indigenous, and it may be doubted whether the gigantic cock be a native. The original of the domestic fowl is most abundant in the woods of the Ghàts. The real partridge, *Perdix picta*, is found in the valleys of the Ghàts. What is usually denominated a partridge in Dukhun, is the *Francolinus Pondicerianus* ; it is numerous, and affects cultivated lands and garden grounds. The common quail of Europe is a native of Dukhun ; and three new species, which I have described, as well as the *Coturnix textilis*, literally swarm. That noble bird the *Otis nigriceps* is met with in large flocks, and the floriken is by no means scarce.

Grallatores.—Of the fourth order, *Grallatores* or Waders, there are 25 genera and 46 species, and very many of the species are common to Europe. *Grus Antigone, Ardea Egretta, Ardea Garzetta, Ardea Asha, Ardea cinerea, Ardea nigrirostris, Ardea Malaccensis, Ardea Caboga, Ardea Grayii, Ardea Javanica, Ardea cinnamomea, Botaurus stellaris, Nycticorax Europœus, Phœnicopterus ruber, Platalea leucorodia, Platalea junior, Ciconia leucocephala, Ciconia Argala, Anastomus Typus, Tantalus leucocephalus, Ibis religiosa, Ibis ignea, Ibis papillosa, Ibis falcinella, Totanus ochropus, Totanus Glareola, Totanus hypoleucos, Limosa Glottoides, Limosa Horsfieldii, Gallinago media, Gallinago minima, Rhynchea picta, Pelidna Temminckii, Parra Sinensis, Gallinula Javanica, Rallus Akool, Porphyrio Smaragnotus, Fulica atra, Cursorius Asiaticus, Vanellus Goensis, Vanellus bilobus, Charadrius pluvialis, Charadrius Philippensis, Himantopus melanopterus,* and *Œdicnemus crepitans.* Of the above, the *Ibis religiosa* is undoubtedly the sacred or mummy *Ibis* of the ancient Egyptians, according to Cuvier's description. The species of the family of the *Ardeidœ* are varied and beautiful. The snipes are those of Europe, as well as most of the species of the *Scolopacidœ*, and some of the *Rallidœ*.

Natatores.—The last order, *Natatores*, or swimmers, contains 13 genera and 20 species, and, as in the preceding order, several of the species are common to Europe. *Plectropterus melanotus, Anser Giria, Tadorna rutila, Anas strepera, Rhynchaspis virescens, Mareca pœcilorhyncha, Mareca fistularis, Mareca Awsuree, Querquedula* Circia, *Querquedula Crecca, Fuligula rufina, Fuligula* ——, *Fuligula cristata, Podiceps Philippensis, Phalacrocorax Javanicus, Plotus melanogaster, Sterna acuticauda, Sterna similis, Sterna Seena,* and *Viralva Anglica.* The geese,

ducks, and teals abound most in the cold season, and are at that period excellent eating. The domestic goose and duck of Europe is not included in the above list, but both are extensively bred in Dukhun. That rare English bird the *Viralva Anglica* is very common in Dukhun. I did not meet with the Pelican, although it is a native of India.

Ichthyology.—The rivers of Dukhun abound with fish, and some of them are not only palatable, but very fine flavoured, particularly the Tambra, a new species of *Cyprinus*, and the Waam, *Macrognathus armatus;* the Singhala or *Pimelodus* is also in very general use by the people, but is not esteemed by Europeans. The fish observed by me consisted of forty-six species; two belonged to the sub-order *Apodes*, three to *Thoracici*, and forty-one to *Abdominales*. The whole were comprised in twelve genera. There was one *Murena*, one *Macrognathus*, one *Chanda*, one *Ophiocephalus*, one *Gobius*, two species of *Silurus*, nine of *Pimelodus* and sub-genera, one *Ageneiosus*, one *Mystus*, twenty-four of *Cyprinus* and sub-genera, one *Essox*, and three species of *Cobitus*. It is remarkable that the fresh water *Essox* of Dukhun so closely resembles the salt water species of England, as to be scarcely distinguished from it, not only in external characters, but in the colour of its bones.

Reptilia.—Reptiles are numerous in Dukhun. The *Trionyx Indica* abounds in the rivers, and there are two smaller species. Many genera of the Saurian family are met with from the four to five feet *Monitor* to the minutest *Lacerta*. Serpents of all kinds, from the gigantic Boa Constiictor to the small and beautiful carpet snake. The first, however, I have only seen carried about the country by people who exhibit the feats of the reptile in swallowing small animals. Independently of the deadly *Cobra da Capello*, (*Caluber Naag*) there are some other poisonous species, but in general the snakes are harmless.

Crustacea.—Of the *Crustacea*, I shall have only to notice the Kenkra, *Thelphusa cunicularis*, a new species which pervades the valleys and table-lands of the Ghàts, and whose numbers are so great that their burrows riddle the earth; they remain quiet in their holes during the cold and dry seasons, but, in the monsoon, they are abroad in such numbers, that travellers drive over them, ride over them, and trample upon them in the high roads: they are not an article of food with the natives, but are, I believe, wholesome.

Testacea.—There are some few genera and species of land and fluviatile shells, the largest of which is a *Unio*; but they do not call for notice.

Entomology.—Like all tropical climates, the Dukhun teems with insects. The domestic fly is a pest at certain seasons; the most rigid precautions and the greatest cleanliness cannot secure the most fastidious person from the inroads of the bed-bug; and there is no getting beyond the "*maximum leap of a flea*"; the fact is, these plagues are not only the constant companions of the people, but the flea inflicts serious injury on poultry, dogs, and cattle. Domestic, and indeed wild animals are subject also to the attacks of a small blue tick, *(Acarus,)* which multiplies upon them in such an incredible manner as to affect the vital functions and produce paralysis and death. There are three species of honey-bee in Dukhun, the honey from the whole of which is remarkably fine. It boasts also its lac insect, *Coccus laccus*; and several silk-producing moths, particularly the Kolesurra, *Bombyx Paphia.*

The most destructive of the insect tribe is the white ant, *Termes*, which, working under cover with the most indefatigable perseverance, finds its way everywhere, and everywhere occasions loss and injury; books, papers, clothes, leather, wood, &c., are indiscriminately devoured. Several species of genuine ants are also a great nuisance. A species of sphex makes its earthen nest within the locks of the doors, and blocks up the key-holes. The musquito, *Culex*, is not quite so troublesome in Dukhun as on the coast. The scorpion, of which there are two or three species, so abounds in the stony lands of Dukhun, that on encamping my regiment, on the march from Punderpoor to Ahmednuggur in 1818, I had from two to three hundred brought to me in the course of a day by my men: their sting produces intolerable pain for a few hours, but is not dangerous unless to the diseased and weakly. The centipede does not attain the growth of its type in South America, nor is it very numerous.

As in other countries, the *Coleopterous* order is the most numerous. Some of the genera are remarkable for their habits, *(Copridæ,)* and some are remarkable for their beauty *(Buprestidæ).* Amongst the *Lepidoptera* many are very handsome, both in the diurnal and nocturnal families *(Papilio Hector* and *Bombyx Atlas).* In the *Hemipterous* order, the *Cimicidæ* abound, and are cursed with all imaginable abominable smells. In the order *Orthoptera*, the *Gryllidæ* are numerous; but the locust is unknown as a scourge. In this order also, the multiplied and strange forms of the *Mantis* and *Phasma* are very striking. The *Blatta* is troublesome and injurious. The *Hymenoptera* includes some valuable and interesting genera. Of the *Apterous* insects I have already spoken. The *Neuroptera* are both numerous and beautiful, some of the *Libellula* and *Myrmeleons* particularly so. Of the *Diptera*, the genera *Musca*,

Culex, *Bombilius*, *Hippobosca*, and *Tipula*, exhibit the greatest number of species and individuals. In *Arachnida* the genera are endless. The prevalence of scorpions I have spoken of.

Civil Divisions.

The British territories in Dukhun are divided into four collectorates, Poona, Ahmednuggur, Dharwar, and Khandesh or Candeish. Over each of these there is a European civil servant of the Company, with several European assistants, for the purpose of collecting the revenue. These gentlemen are armed with magisterial powers, and can call upon the military authorities for assistance. These collectorates are divided into Talooks (great divisions), provinces, Pergunnahs (counties), and Turrufs (hundreds);* and native officers called Mamlutdars, aided by inspectors of cultivation, accountants, treasurers, and a police force, are placed over one or more Pergunnahs. All these terms are of Moosulman introduction; the ancient Hindoo civil officers being differently named, and their territorial divisions were Pránt, Deshmookee, and Naikwaree. The aggregations of habitations are called Sher (city), Kusbeh (market-town), Mouzeh or Gaòn (village), and Waree (hamlet). The cities and towns may comprise several villages, and they have their suburbs called Peit. The village constitution is noticed under land tenures.

Poona Collectorate.—The Poona Collectorate is the nearest of the four collectorates of Dukhun to Bombay: its boundaries towards the coast approach within about fifty miles of that presidency, but they do not descend the Ghàts into the strip of land at the foot of the Ghàts, called the Konkun (Concan). This collectorate has an area of 8281 square miles, including the lands held in military tenure (Jagheer). It contains 550,313 inhabitants, 1897 towns† and villages, and 114,887 houses; averaging 66·45 inhabitants to a square mile, 4·79 to a house, 247·36 to a village, exclusive of the population of Poona. The chief town is Poona, recently the capital of the Mahratta empire, containing a population of 81,315 souls. The other principal towns are Tullegaon (2050 males, 2007 females), Joonur (4218 males, 3759 females), Kheir (1999 males, 1794 females), Goreh (1154 males, 1145 females), Ootoor (2521 males, 1928 females), Narraingaon (1286 males, 1180 females),

* Provinces, counties, and hundreds are not the exact equivalents of the native territorial divisions, but they afford sufficiently approximate types.

† Trifling transfers have taken place between the different collectorates, so that this may not be the exact amount at the present moment,

Alley (1396 males, 1064 females), Sassor (1880 males, 1696 females), Jeejooree (885 males, 860 females), Tullegaon, *Turruf Paubul* (1710 males, 1427 females), and some others; but the most populous of the number, as is seen above, contains only 7977 souls. There are, excluding Sholapoor, 8 pergunnahs and 32 turruffs in the Poona collectorate. In Sholapoor sub-collectorate there are 4 talooks, 19 pergunnahs, and 12 turruffs; but as divisions which in the other collectorates are called turruffs, are here called pergunnahs, there are few turruffs. My limits will not permit of detailed descriptions of these pergunnahs, although there are many physical facts of interest connected with some of them.

The following number of towns and villages constitute the different pergunnahs and talooks: Sewnere 190, Indapoor 86, Kheir 236, Pabul 65, Poorundhur 130, Beemthuree 92, Hawailee 165, the Mawuls 233, Sholapoor 122, Mohol 145, Indee 236, and Moodebehal 226. This makes a total of 1926, which is 29 villages more than was previously stated, but this is owing to depopulated villages being included; of this 1926, 47 towns and 1429½ villages belong to the British; 4 towns and 264½ villages are held in free gift (Eenam), and 3 towns and 178 villages are held on tenure of military service (Surinjam).

Hill forts.—In the Poona Collectorate are situated many remarkable hill forts, impregnable in fact if properly defended, from their geological structure, which consists of beds of basalt, with vertical edges, alternating with beds of amygdaloids, whose edges form a talus. Many of these in their superficial plane manifest a strong disposition to a trigonal character. Such is the case with Teekonee (the word being almost Greek,) or three-angled, Koaree, and some others. Koaree is situated at the edge of the Ghàts in the civil division called the Powar Khoreh; its summit is 2910 feet above the sea; and some parts of the rock within its area are so powerfully magnetic, as to draw the needle quite round the compass. The hill forts of Singhur, Poorundhur, and Wuzeerghur are seen from Poona: the summit of the first is elevated 4192 feet above the sea, and the second 4471 feet. The hill-fort of Sewnair, in which the celebrated Sewajee was born, is situated close to the city of Joonur (Jooneer). Jewdun, is on the edge of the Ghàts, a few miles westward of Joonur, and Hurreechundurghur, which is said to be eighteen miles in circumference at its base, is situated a few miles N. W. of Joonur. But I have not space to enumerate all these points of defence provided by nature,—Loghur, Eesapoor, &c. &c.

Boodh cave-temples.—Some works of art must not be overlooked. The first is that magnificent cave-temple situated in the civil division called Naneh Mawul; it is usually denominated the cave of Karleh (Carlee),

from being within two miles of a village of that name; the temple is associated with many cave-chambers. The other Boodh excavations are pierced in the hills around the city of Joonur, under the hill-fort of Joonur, and at the crest of the pass into the Konkun from Joonur, called the Naneh Ghàt. Numerous inscriptions, in so antique a form of the Sanscrit alphabet as not to be readable by modern Sanscrit scholars, abound in these caves.* These astonishing works of art, resulting from the labour of ages, and which are met with, not only in the Poona Collectorate, but in many other parts of India, would seem to indicate that the country was once inhabited by a Boodhist population, although it has so entirely disappeared, that not a solitary worshipper of Boodh remains in the peninsula of India.

In the Under Mawul, at the village of Mhow, there is an extraordinary large Wuhr-tree (*Ficus Indica*); it has sixty-eight stems, most of them thicker than a man's body, and, with the exception of the original stem, the whole of them originate in roots let down from the branches; it was capable of affording shade, with a vertical sun, to 20,000 men, being 201 feet long by 150 feet broad. At the town of Munchur, in the pergunnah of Pabool and Turruf Wurgaon, there is a Baubel-tree *(Mimosa Arabica)*, of surprising magnitude; at eighteen inches from the ground the trunk measures nine feet and half an inch in circumference; its head is ramous and dense, and it gives a vertical shade covering 5964 square feet: this species produces gum arabic. In the turruf of Chakun, pergunnah Kheir, near to Mahloongah, on the slopes of some hills, the shrub or small tree, producing the gum olibanum, *(Boswellia thurifera)*, is met with; and it is seen also in other parts of the country. At Mahloongah there is a garden of flourishing cocoa-nut trees; and considering that they are at 2000 feet above the sea, and 100 miles inland, the fact is sufficiently remarkable: clumps of them are also met with at Pabool and other places.

Rivers.—The rivers flowing through the Poona Collectorate are the Mota, the Mola, the Inderanee, Under, Beema, Goreh, and Kokree, and some smaller streams. All these have their sources in the Ghàts, within the limits of the collectorate; they converge to the Beema, which falls into the Kistnah, and thus finally reach the Bay of Bengal. The rivers are only navigable during the monsoon, and then only partially. Boats with sails are not seen upon them.

* Within the last year, those indefatigable and learned orientalists, Principal Mill, Mr. James Prinsep, and Mr. Stevenson have succeeded in reading most of the inscriptions which are found to relate exclusively to Boodhism and Boodhists.

Ahmednuggur Collectorate.—The Ahmednuggur Collectorate adjoins the Poona Collectorate on the east and north. Part of its frontier is along the Ghàts; the rest is bounded by the Chandore range of hills on the north, and by the Nizam's territories on the east and S. E.

Ahmednuggur has an area of 9910 square miles; it contains 666,376 inhabitants, dispersed in 2465 towns and villages, averaging 263·47 inhabitants to a village, (exclusively of the population of Ahmednuggur); 67·24 inhabitants to a square mile; 136,273 houses and 4·89 inhabitants to a house*.

Ahmednuggur is divided into 14 talooks, 36 pergunnahs, and 51 turruffs. Talook Ahmednuggur contains 157 towns and villages, Kurdeh 172, Sungumnair 226, Akoleh 194, Newassa 359, Nasseek 280, Sinnur 107, Chandwur 153, Patodeh 255, Wun Dindooree 175, Barsee 124, Kurmulleh 82, Jamkheir 90, and Kortee 115. The total of these is 2438, instead of 2465; the difference originates in 23 depopulated villages being included. Of the above, 43 towns and 1858½ villages belong to the British; in 27 towns and 554¼ villages the British government has a quit rent, these villages being called Doomaleh,† alienated. Only one village in free gift was returned to me, and one town and three villages in military or feudal tenure; but the villages in free gift (Eenam) are included in the Doomaleh villages.

The chief town is Ahmednuggur, with a population of 17,838 souls in 1822: men 5953, boys 3350, total males 9303; women 5976, girls 2559, total 8535. The other chief towns are Kurdeh, Nasseek, Chandore, Sungumnair, Parnair, &c.; but their population I cannot state, as the total amount of the population of pergunnahs only was sent to me by the collector‡. The most populous pergunnah would appear to be Nasseek, containing 71,581 inhabitants. The least populous pergunnah was Soagaon, containing only 9400 inhabitants.

Rivers.—The rivers running through the collectorate are formed by numerous streams originating in the Ghàts and Chandore range,—such as the Peera, the Mool, the Doornah, and the Gooee, which converge to that noble stream the Godavery, which also has its rise in this collectorate, near Trimbuck, and flows to the eastward to the Bay of Bengal.

* This return is for 16 pergunnahs only.

† The proper meaning of Doomaleh is "two properties," the chief part of the revenue being alienated, but the government having a quit rent.

‡ The population returns forwarded by me not having been filled up, in consequence of a census of the population having been made by the collector himself within three years preceding.

The Seena is the only river of consequence which does not originate in the Ghâts. It has its course at the edge of the plateau on which the city of Ahmednuggur stands, about ten miles north of the city, and flows in a S. S. E. direction into the Beema.

There are several remarkable hill forts in the western part of the collectorate, such as Trimbuck, &c. Ahmednuggur was once the capital of the Ahmed Shahee dynasty of kings.

Khandesh or Candeish Collectorate.—The area of the province or collectorate of Candeish, deduced from a map in the Deputy Surveyor General's Office, including tracts belonging to foreign states and to Jagheerdars, is 12,527 square miles. It is bounded on the north by the Sautpoora mountains; on the east by the province of Berar, belonging to the Nizam; on the south by the Indyadree range of mountains, which separate it from Ahmednuggur; and, on the west, by Dang and Raj Peeplee, which bring it into contact with Goojrat. It is literally a Khind or Khund, a great *gap* between ranges of mountains, whence its name of Khandesh or Candeish. Some of the northern and western parts are little better than a jungle, and the whole province is miserably depopulated. The populated part of the collectorate belonging to the British, derived from the returns of the lands of 1982 populated villages, give an area of 6760 square miles, with a population of nearly 55 inhabitants to the square mile; but supposing 1684 alienated and deserted villages to have a proportionate quantity of lands, the area will be 12,504 square miles, with $38\frac{1}{3}$ inhabitants only to the square mile, and this I believe to be very near to the truth. It is curious that the area derived from the village lands should approximate so closely to the area determined trigonometrically.

The collectorate is divided into sixty-six pergunnahs, some of which do not contain more than one village each, whilst the largest, Nandoorbar, has 259 towns and villages, Nowapoor 236, Sooltanpoor 232, Rawere 160, Jamnair 144, Amulnair 140, and Bhamere 150, including deserted villages. The total number of towns and villages is 3666; but of this number 330 are *pyegusta*, which means that the villages are deserted, but that part of the lands are cultivated; 999 are entirely deserted; but great confusion and uncertainty prevails in the details, for of this number there are 51 whose limits are unknown, 12 whose sites are *unknown* but names known, and 135 whose *names* and sites are unknown but a record remains of their number. There are 227 populated Jagheer, or alienated villages; and many amongst the Pyegusta, and deserted also, belong to Jagheerdars, so that it does not appear that more

than 2032 populated villages belong to the British *; of this number 1968 sent in population returns. The most populous town in Khandesh was Nandoorbar, and it had only 6429 inhabitants; and only one other town (Chopra) had a population of 6000. The towns and villages average only 178 inhabitants, and each house averages 3·96 inmates. The total of the inhabitants is 478,457.

From the village lands in Khandesh being kept universally in Beegahs, the amount of land under cultivation is readily determined. It would appear that 15,958 acres were watered by perennial streamlets. Lands so watered are called *pahtstul*, and are the most valuable of all, as the supply of water is mostly permanent, and the chief labour required is to open the channels and let it flow over the lands; 46,064 acres were watered from wells, and lands so watered are called *Mohtstul*:† 600,556 acres were under field cultivation, and are not watered,—these lands are called *Zerhaeet*. The per centage of cultivated and waste lands in this collectorate is as follows:—

Watered by perennial streams Watered from wells.............. Field cultivation..................	15·32 per cent.
Waste land...........................	84·68 do.
	100...

Rivers.—The River Tapty runs through the whole length of the collectorate, and, unlike the rivers of the other collectorates, disembogues into the Gulf of Cambay, below Surat; the water-shed of the country being in fact from the east to the west, instead of from the west to the east; there are some exceptions in rivers which rise in the Western Ghàts, or the Chandore range, and run to the east for some distance, then sweep round in a segment of a circle and join the Tapty; such are the Guirna, Roharee, the Moosum, &c. Timber is floated down the Tapty in the monsoon.

Boodh Cave Temples.—Near to the Adjunta Pass, through the Chandore range, from Ahmednuggur into Khandesh, or a multitude of those astonishing remains of Boodhist art, consisting of excavations in the mural faces of the trap rocks, the interior walls of which excavations are

* In the Collector's revenue return for 1827-8 the number of villages is stated to be 2697½, so that 335½ of the deserted villages had become inhabited, independently of 330 uninhabited villages whose lands were included in the return.

† Paht means a water-channel, and Moht means a well-bucket; implying in the first instance that lands are watered from streamlets, and in the second instance from wells.

covered with bas-reliefs; indeed, with fresco paintings also, illustrative of the arts and social relations of life, like the paintings on the tombs of the Egyptian kings.

Dharwar Collectorate.—Agreeably to information obtained from the Revenue Survey Department, that part of the southern Mahratta country, bounded on the north by the Kolapoor territory and the Kristna river, on the east by the Nizam's dominions, on the south by Mysore and the Toomboodra river, and on the west by Soonda and the Sybadree Ghâts, comprises an area of 11,747 square miles, namely,

	Square Miles.
British possessions........	8378·439
Do. Manowlee Talook, from the Kolapoor territory.........	390·474
Sawanoor Jagheer....................................	74·750
Sawuntwaree territory	188·934
Nizam's territory..	47·930
Gudjundurghur jagheer..................................	69·344
Putwurdun and other jagheers...........................	2597·167
Total........	11747·038

The Talooks of *Cheekooree*, 354 square miles, and *Munowlee*, 390 square miles, have been added to Dharwar, so that the area of the collectorate now amounts to 9122·913 square miles; but 39 per cent. of this consists of wood and jungle, and uncultivated lands, and 61 per cent. appears upon the returns as cultivated.

Dharwar is divided into 22 Talooks and 137 *Turruffs, Mahls, Summuts*, or *Khiryats*, independently of the subdivisions of the Talooks of Cheekooree and Munowlee. The Talook of Dharwar has 136 towns and villages, Meesreekoht 133, Purusghur 59, Nowlgoond 43, Hoongoond 170, Dumbul 96, Bunkapoor 115, Nuwee Hooblee 97, Ranee Beednoor 139, Kettoor 81, Sumpgaon 70, Beereeh 135, Rhone 77, Bagulkoht 141, Hangull 173, Goottull 123, Badamee 148, Padshapoor 202, Kohr 182, Talooks of Cheekooree, and Munowlee 225. To the above are to be added 189 villages, 47 of which sent in poppulation returns, although their names were not in the government list; 108 were not included because they were Jagheer or Eenam villages; and 34 were depopulated and overlooked. The total number of villages in the collectorate amounted to 2734; of this number 2491 were populated, and 243 were deserted. Of the above, 1899 British villages sent in returns, 225 did not send returns; 155 were deserted, but their lands were under cultivation by neighbouring villagers; 230 alienated villages sent in returns, 137 alienated vil-

lages did not send in returns; and 88 deserted villages had not their lands under cultivation. With the aid of some trifling estimates the total amount of population appeared to be 838,757, averaging 91·94 inhabitants to the square mile, 336·71 to a village, and 4·48 to a house. Of the 119 British towns, there are only three whose population exceeds 10,000 souls, viz. Dharwar 11,802; Belgaon 11,037; and Mujeedpoor 15,387. One town has above 8000 inhabitants, (Bagulkoht); two with 6000; one 5000; thirty-six with from 2000 to 4000; and seventy-seven with from 1000 to 2000 souls. All the village lands being kept in definite measurements, it appeared that the cultivated land of the whole collectorate was 61·11 per cent., and waste only 38·89 per cent.

Rivers.—All the chief rivers of Dharwar flow to the eastward; they have their source in the Ghàts, and join the Kistnah. The principal are the Gutpurba, the Malpurba, and the Wurdah: the falls of the Gutpurba, near to Gokauk, are said to be strikingly fine.

Hill Forts.—Dharwar, like the other collectorates, has to boast of its hill forts.

Viewing Dharwar, whether with respect to its numerous towns and well-peopled villages, the comparative density of its population, the size of its farms, the quantity of land in cultivation, the amount of its revenues, the lightness with which they press supposing they were raised as a poll tax, the indications of manufacturing industry (so languishing elsewhere) in the number of its weavers, and its superior means of school instruction, it is unquestionably the finest of the British possessions in Dukhun.

Population.

The great feature in the population of Dukhun is the excess of males over females in a greater proportion than exists in Europe. By the last census in England there were 100 males to 93 females. In the British possessions in Dukhun, in a population from which returns have been received of 2,302,902 souls, there are 100 males to 87·36 females, and this difference obtains, with very little variation, throughout the different casts. It is subject to modification, however, by a very singular fact, exhibited in the excess of grown up women over men wherever the returns distinguish the adults from children; but the excess of male children over female leaves the ultimate preponderance in favour of the males. From Sir Stamford Raffles' *History of Java*, the same relative proportion of the sexes would appear to exist in that island. He states that the proportion of males and females born in Bantam, and over the whole of Java, is nearly the same as in Europe, and as is found generally

to exist wherever accurate statements can be obtained. From the information he collected in a very careful survey of one province, the preponderance seemed to be on the side of male children to an extraordinary degree; the male children being about 42,000, and the female 35,500, i. e. 100 males to 84·52 females. He says also there were formerly great drains on the male population, and which, in advanced stages of life, might turn the balance on the other side; indeed, in some of his returns this is shown to be the case.

In Dukhun, wherever the means have been afforded to me of ascertaining, I have found the preponderance of male over female children to be marked, not only in births, but as long as they continue to be classed as children; although a great mortality, at a subsequent period, makes the grown up females outnumber the grown up males.

Males and females.—In the Poona Collectorate in 1826 the births of males in 32 turruffs were 100 to 94·27 females, or very nearly 20 males to 19 females. The result of eighteen years' very careful observations for all France, from 1817 to 1834 inclusive, gives 17 males for 16 females; and as this is derived from more than seventeen and a half millions of births, it is worthy of every confidence. Taking each year of the above period, the extreme variation was from 15 males to 14 females as far as 19 males to 18 females. My deduction varies so little, that we may fairly say the same law equally obtains, whether in a tropical or an extra-tropical climate. Amongst illegitimate births in France it would appear that the number of females approximates more nearly to males than in the legitimate births; the numbers, according to the French tables, being 24 males to 23 females: reducing all these to a common denomination, we have in the

Poona Collectorate.........	94·27	per cent.	of female births.	
In France, the average of 18 years, legitimate....	94·11	do.	do.	
In France, legitimate for 1 year,.......	93·33	do.	do.	extremes.
In France, legitimate for 1 year,.......	94·73	do.	do.	extremes.
In France *illegitimate*, average of 18 years,	95·83	do	do.	

It would thus appear that amongst illegitimate children there are nearly two more females born to every hundred males than amongst legitimate births.

In the abstract of the census of the population of the Ahmednuggur Collectorate, taken in 1822, the boys were to the girls as 100 to 62·16; a singular disproportion; there being in the whole collectorate 96,447 boys, and only 59,956 girls; but the men were to the women only as 100 to 102·18, the number of men being 146,750, and the women 149,945. In the city of Poona, in 1822, the boys were to the girls as 100 to 73·26, a greater disproportion than Sir Stamford Raffles found in Java; at the same time the adult men were to the women as 100 to 103·40. In the classes only of the Brahman priests, mendicants, and traders, were the men found to exceed the women. In the city of Ahmednuggur, in 1826, there were 100 boys to 67·62 girls, but 100 men only to 106·06 women; but the ultimate relation of males to females was as 100 males to 92·46 females.

The following table shows the proportion of males to females in the different collectorates, and their principal cities and towns:

Collectorates.	Males to Females.	Cities and Towns.	Males to Females.
Poona Collectorate	100 to 88	Poona	100 to 94
Ahmednuggur do.	100 to 86	Ahmednuggur	100 to 92
Khandesh do.......	100 to 85	Joonur..............	100 to 89
Dharwar do.	100 to 89	Dharwar	100 to 98
		Belgaon	100 to 91
		Bagulkoht	100 to 101·25
		Gunness Part......	100 to 101·14

Births, Deaths, and Marriages.—Returns of births, deaths, and marriages, in an available form, were received only from 32 turruffs of the Poona Collectorate, comprising 1109 towns and villages, but not including the city of Poona, containing 81,315 inhabitants; my information, therefore, on these subjects must necessarily be circumscribed, but the little there is is valuable from its novelty. Some returns came to hand from the Collectorate of Dharwar, but they were merely additions of the totals of irregular numbers of villages, (from 2 to 12,) and I hesitated

to trust to results which I could not test by the original returns. Respecting births, deaths, and marriages in the Ahmednuggur and Khandesh Collectorates, I am totally without information, excepting a solitary return of deaths in the city of Ahmednuggur in 1828, which is worthy of every confidence, as it was compiled by my friend Dr. Walker, late Civil Surgeon at Ahmednuggur.

Births.—In the Poona Collectorate the average births, in a population of 250,300, amounted only to one in 50·52 persons, or not quite two per cent.; the Brahmans having the smallest proportion, (1 in 57·29), and the Moosulmans the greatest proportion, (1 in 40·80); the range of births in the different turruffs was from 1 in 15·70 to 1 in 153·60 persons; and, on the whole, the hilly tracts had a greater number than the plains.

Deaths.—The deaths were 1 in 37·34 persons in the 32 turruffs, or 2·67 per cent., indicating a somewhat alarming diminution in the population;* the range varied from 1 in 17·21 to 1 in 70 persons, the fewest deaths being in the hilly tracts. It must be considered, however, that the spasmodic cholera was raging in the country in that year, and that the deaths from that unaccountable and dreadful malady in two turruffs amounted to nearly 5 per cent., and in one turruff to 6 per cent. of the whole population. It is to be presumed, therefore, in the absence of cholera, the births would exceed the deaths, as was in fact the case in some of the Mawuls, or hilly tracts, where it was known the cholera did not penetrate. In deaths the Moosulmans were the greatest average sufferers, (1 in 20·15) and the low casts were the least sufferers, (1 in 42·94).

As Dr. Walker found that the cholera in the city of Ahmednuggur increased the usual deaths 0·66 per cent., the loss being 2·48, while the cholera raged, and only 1·82 per cent. when the scourge ceased, it is but fair to infer that such would have been the case in the country at large; and this element, applied to the mortality in the Poona Collectorate, would reduce the annual loss to 2·01 per cent., or one death in 50 persons, which would indicate a greater degree of healthiness than all France, all Belgium, or the town of Glasgow, the loss in all these places being 1 in 39 and a fraction.

Marriages.—The average number of marriages in the Poona Collectorate is proportionably more than in England and France, being 1 in 125·87 souls; the proportion in England being 1 in 128, and in France 1 in 130·4 inhabitants. The range in the different turruffs is from 1 in 40·11 to 1 in 493.77; but in 14 turruffs the average is considerably un-

* The deaths in the kingdom of Naples for 1836—37 was 1 in 37 and a fraction.

der that for England. The Shoodruhs (Mahrattas proper) and Moosulmans are almost identical, in their proportional number of marriages, namely, 1 in 116·21 and 1 in 116·86, and they have the greatest number of marriages; the low casts have the fewest marriages. The births in 1826 being only 4954 and the marriages 1998, the average of children to a marriage was 2·48 or not quite 2½. In France the average is 3·72 children to a marriage; in England and Wales 3·55. In Java the births were 1 in 39, deaths 1 in 40 persons.

The constituents of the population in the different collectorates were

	Constituents of the Population.				
	Brahmans.	Rajpoots.	Shoodruhs, &c. Mahratta Cultivators, &c.	Atee Shoodruhs or low casts.	Moosulmans.
Poona..........	Per Cent. 11·58	Per Cent. 0·41	Per Cent. 73·85	Per Cent. 9·78	Per Cent. 4·38
Ahmednuggur...	Unknown.	Unknown.	Unknown.	Unknown.	Unknown.
Khandesh.......	5·40	3·47	69·58	14·72	6·38
Dharwar........	4·48	0·60	74.53	11.895	8·495

In the above analysis the chief features are the permanent and nearly equal proportions of the Shoodruhs or Mahratta cultivators and other genuine Mahrattas, which obtain in the different collectorates; the fact being, that three-fourths of the population are of that most useful class the Shoodruhs; and it will be seen by the notice on agriculture, how large a proportion of them are engaged in tillage. In the Poona Collectorate, as might be expected from its having been the chief seat of a Brahman government, there is a considerable number of Brahmans; every ninth person, in fact, being a Brahman. In the other collectorates scarcely one in twenty persons is a Brahman. Genuine Rajpoots are little known in Dukhun, and I should doubt whether or not the 3½ per cent. of Rajpoots, in the returns from Khandesh, should be added to the Mahratta population; who, by the bye, have some pretensions to being descended from the Rajpoots. The proportion of low casts,* men who

* The low casts comprise all that part of the Hindoo population which cannot claim to be Shoodruhs, such as Mahrs, Dhers, Maangs, shoemakers, skinners, Ramoosees, Beruds, and Bheels. The Mahrs and Dhers are the scavengers, the Maangs, executioners; shoemakers and skinners speak for themselves; the Ramoosees and Beruds are *born* thieves, or are thieves by cast, and they are usually employed for the protection of villages, on the principle of setting a thief to catch a thief. The Bheels are supposed to be the aborigines of the countries where they are found.

are only engaged in vile or discreditable offices by the natives, although otherwise employed by the British, does not differ very much in the different collectorates; the increase in the Khandesh collectorate is attributable to large tracts of the country being inhabited by Bheels, who are a low cast; in fact, less than every seventh person is a low cast; in Poona about every tenth, and in Dharwar about every eighth. The Moosulmans are few in number in the Poona and Ahmednuggur Collectorates, not being one-twentieth of the population in the first, nor one-fifteenth in the second; but, in the Dharwar Collectorate they displace the Brahmans, and amount to nearly one-eleventh. Although the Moosulman power has been paramount nearly throughout all India for centuries, it is believed they have never constituted one-fifteenth of the whole population. In the abstract of the population returns from the Ahmednuggur Collectorate, the casts are not distinguished; but, in a return of 1828, from the city of Ahmednuggur, the Hindoo inhabitants are distinguished from the Moosulman; and it is found that there is the very unusual proportion of one Moosulman to 3·45 Hindoos, or 29 per cent. of the whole population. This is to be referred to the fact of Ahmednuggur having once been the capital of the Ahmed Shahee dynasty of Moosulman kings; with these exceptions, although I have not detailed returns to guide me, I believe that the constituents of the population of the Ahmednuggur Collectorate do not differ in their proportions from those of the Poona Collectorate. In the census of 1822, the families in the fifteen pergunnahs in the Ahmednuggur Collectorate, with a population of 409,279 souls, were enumerated, and it appeared that there were 4·53 persons to a family. With respect to the styles of building in the Ahmednuggur Collectorate, it will be fully illustrated by the facts, that the *tiled* houses amount only to 10·84 per cent. of the whole; the thatched houses to 32·27 per cent.; and the mud flat-terraced houses to 56·89 per cent.

Bearing in mind the clouds of horse that covered the Dukhun in the war of 1817, it is sufficiently remarkable that in 1822, in the whole Collectorate of Ahmednuggur there were only 405 full-grown horses, 1298 full-grown mares; the total, including colts and fillies, being only 2500; the ponies amounted to 12,632, of all kinds.

Proportions engaged in agriculture.—In 1828, in this collectorate, 1878 British villages contained 41,948 cultivators or farmers, and a population of 512,818 souls, and allowing five persons to a cultivator's family, 40·89 per cent. of the people were engaged in agriculture. In Poona there were 52,668 farmers, being a per centage of 55·50, with five persons to a family. In Dharwar 60,701 cultivators, being a per centage of

41·76*, and in Khandesh 44·608 cultivators, being a per centage of 53·16 occupied in agriculture. It is to be understood these proportions have reference to the population of British villages only, and not to the whole population of each collectorate. Moreover, as these proportions are derived from the registered farmers only, and as they are in the habit of sub-letting their lands, I have no hesitation in expressing my opinion that exact returns would prove that three-fourths of the population are directly engaged in agriculture. In the Poona Collectorate, families were not enumerated, excepting in the return from the city of Poona, and here families average 4·82 persons; each house in Poona averaged 6½ persons; but, for the whole collectorate 4·79 persons to a house; so that it is probable the returns of the number of houses would give the number of families. In Khandesh the proportion of inhabitants to a house falls short of the other collectorates, being only 3·96 persons. In Dharwar the number is 4·48 to a house, for the whole collectorate; but the towns exhibit other figures; namely, Belgaon 5·24, Chabee 5·78, and Gunness Pait 5·77 inhabitants to a house; England and Wales has 5·60. The average inhabitants to the square mile, in the different collectorates, has been noticed under the head of civil divisions; and the fewness will disappoint European expectations; but there is plainly a great mistake in the common estimation of the denseness of the Indian population. Bengal proper is said to have 203 inhabitants to a square mile, and Orissa, in the cultivated parts, agreeably to Mr. Stirling, the commissioner, has 135; but, for the whole area of Orissa, the average is only 14½ inhabitants to the square mile; England has 192.

Southern Jagheerdars.—The Southern Jagheerdars have 917 villages, with an *estimated* population of 263,236 souls.

Rajah of Sattarah's territories.—The Rajah of Sattarah, in his territories, has 1703 towns and villages, with an estimated population of 488,846 inhabitants.

With the data in my possession I am enabled to give an estimate of the population of the late Peshwa's territories in Dukhun; it affords a closer approximation to the truth than has hitherto been obtained.

* Including some returns of alienated villages, an estimate makes it 48 per cent.

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
Ahmednuggur.	1655½	The census of 1822, in the Ahmednuggur Collectorate, in 1655½ towns and villages, exclusive of the city of Ahmednuggur, each village averaging 263·47 inhabitants, gave..	453,098	
	223	223 British villages of Talooks, Kurmulleh, and Korteh, from which population returns were not received, averaging 263·47 souls, give.......	58,753	
	586½	586½ alienated towns and villages, from which returns were not received, averaging 267·47 souls, will give	154,525	666,376
	23	Depopulated villages		
	2488	Total villages in the Ahmednuggur Collectorate.		
Poona Collectorate.	895½	In the collector's revenue statement for 1828 there appeared 1469½ British villages; viz. 895½ towns and villages inclusive of the city of Poona, which sent in population returns in 1826, the villages averaging 226·10 inhabitants, exclusive of the population of the city, give	283,567	
	212½	212½ alienated villages sent in population returns	48,048	
	56 4	56 alienated towns and villages, and 4 British villages, did not send in returns, averaging a population of 226·10 souls each....................	13,566	
	574	574 British villages of the Sholapoor sub-collectorates did not send in returns, averaging by estimate 226·10 souls each.............	164,294	
		Had the average number of inhabitants to a village in the Ahmednuggur collectorate been used as an element, the result would have been 151,145		
	155	155 alienated towns and villages of the Sholapoor sub-col-		

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
		lectorate at 266·10 souls each	40,838	550,313
	29	Depopulated villages.		
	1926	Total towns and villages in the Poona Collectorate.		
Khandesh Collectorate.	1968	In the collector's revenue statement for 1828, there were 2697½ villages; of this number, 1968 British towns and villages sent in population returns in 1826, averaging 187·39 inhabitants to a village, equal to	368,781	
	64	64 villages, refused returns, at 127 souls each.......... ...	8128	
	330	330 villages are cultivated, but not inhabited, making a total of 2362 villages.		
	335½	To make up the number in the collector's revenue statement therefore, 335½ villages must be added as having become populated since the population returns were sent in, at 127 souls each......	42,608	
	14	14 Jagheer villages sent in returns......................	2623	
	300½	Jagheer, or alienated villages, did not send in returns, at an average of 187·39 souls each	56,317	478,457
	654	Depopulated villages, lands not cultivated.		
	3666	Total towns and villages in the Khandesh Collectorate.		
Dharwar Collectorate.	1899	In the collector's revenue statement for 1828, there appeared 2279 towns and villages; of this number, 1899 British towns and villages sent in population returns, averaging 348 inhabitants to each village............ ...	660,852	
	225	225 British villages in the talooks of Cheekoree and Munowlee did not send in returns; estimating their population		

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
		from the revenue they yield, falling as a poll-tax as in other parts of Dharwar, there are..	65,805	
	155	British depopulated villages, lands under cultivation.		
	230	Alienated villages sent in population returns........	79,727	
	137	Alienated villages did not send in population returns, at the lowest average of population, 236·30 each..........	32,373	838,757
	88	Deserted villages, lands not under cultivation.		
	2734			
Southern Jagheerdars' lands.	917	The area of the Southern Jagheerdars' territories is 2978·125 square miles at 88·39 inhabitants to the square mile, the lowest average of the Dharwar Collectorate gives by estimate..........	263,236	263,236
Rajah of Sattarah's territories.	1703	1703 towns and villages under the Sattarah government, with an estimated population of 287·05 inhabitants to a village, which is the mean between Dharwar and Ahmednuggur, will give..........	438,846	488,846
	12,155	Populated villages.		
	1,279	Depopulated villages.		
	13,434	Total.		3,285,985

ABSTRACT OF THE ABOVE.

Collectorate or Territory.	Area, square miles.	Number of Towns and Villages.	Population.	Average to the square mile.	Average to a village for the whole Collectorate	Average to a house.
Poona	8281	1926	550,313	66·45	* 247·36	4·79
Ahmednuggur.......	9910	2488	666,376	67·24	† 263·47	4·89
Khandesh..........	12,527	3666	478,457	38·19	178·39	3·96
Dharwar...........	9122	2734	838,757	91·94	336·7	4·48
Southern Jagheerdars..............	2978	917	263,236	88·39	287·05	Not known.
Rajah of Sattarah's territories.........	6169	1703	488,846	79·25	287·05	Not known.
Total..............	48,987	‡13,434	3,285,985	67·07	270·34	

Average number of inhabitants to a village for all the collectorates, 270·34.

The above population does not include the army, camp followers, Bheels, or the wandering tribes.

It would appear there are 1279 uninhabited villages in the four collectorates of Dukhun, principally in Khandesh; making a total of 10,814 towns and villages in the British possessions, and of 13,434 in the late Peshwah's territories in Dukhun; exclusive of those belonging to the Kolapoor state.

Total alienated villages in the four collectorates, 1695½. Total British populated villages, 7839½; total deserted, 1279. Total villages in the *four collectorates*, 10,814.

Education.

Education, as a regular system, is certainly unknown amongst the people in Dukhun. The few schools existing are wholly disproportioned in number to the population; and even were they more numerous, the present general poverty of the Koonbees,§ and the imperious calls upon them for the services of their children in agriculture, and in attending their cattle, would disable them from letting their children profit by instruction, even though gratuitous. In a stage of civilization which is by

* Exclusive of the population of the city of Poona.

† Exclusive of the population of the city of Ahmednuggur.

‡ Of this number, 1279 are depopulated, and the depopulated villages of the Southern Jagheerdars and Rajah of Sattarah's territories are not known to me.

§ Mahratta cultivators.

no means contemptible, the general illiterateness of the cultivators is remarkable. It might have been supposed that the pressure of the inconveniencies and the risk of loss attending the solving their constantly recurring arithmetical computations, whether in settling their assessments with government, in ascertaining the amount of their produce, or in computing its saleable rate to ensure a profit, or in their money transactions with each other, would have stimulated some families of the past or present generations to have pursued steadily a course of instruction for their children, which, by its example and the visible beneficial results attending it, would have originated a thirst of knowledge, and advanced the march of intellectual improvement. The Shoodra, however, is led to believe by the wily Brahmans that letters and science are not within his province, and the farmer is content to go on mastering his arithmetical difficulties with the assistance of his fingers, and relying upon the village clerk for the keeping his accounts with the government, and on his ability, judgment, and secrecy in the management of his private correspondence, which, it may be supposed, will not be very important or voluminous. Were it ascertained, I believe not one cultivator in a hundred would be found able to write, or count up to 100 but by fives; and my daily unreserved intercourse for hours with numbers of this class of persons has given me facilities for forming this opinion. And yet the Koonbees are far from wanting intelligence; they are not slow in observing; they are quick in communicating, and the rationale of an agricultural process is frequently explained with a simplicity and effect which we might not always meet with in the educated English farmer. There would not be any difficulty in teaching the Koonbees, provided the instruction were gratuitous, and that the farmer could spare his children; and several important effects might attend this instruction: the mind of the cultivator would be invigorated with new ideas; enlarged views of action would break in upon him; a spirit of improvement, enterprise, and innovation might spring up, in place of the apathetic routine that at present prevails in rural œconomy and in the social relations of life; and an amelioration, both physical and moral, would take place in his condition. But at present the little education that exists is confined to the Brahmans and to the shopkeepers, Shaitees*, and Mahajuns.†

The Koolkurnees‡, or accountants and village-clerks, are always Brahmans; many of them are shrewd and very quick, and possessed of infi-

* Heads of trades. † Bankers.

‡ Village clerks and accountants.

nite ingenuity in avoiding the detection of a fraud or mistake in their papers ; many of this class, however, I found too stupid to keep an individual's account, much less the complicated details of a village assessment. The shopkeepers being generally people from Goojrat, keep their accounts in the Goojratee language. The character in universal use for business is the Mohr in the districts. The following will show the number of schools, as far as the returns received from the collectors will permit,—not any account of schools was received from the collector of Ahmednuggur. In the Collectorate of Dharwar there is one school to 2452 inhabitants ; in Khandesh there is only one school to 4369 souls ; and, in the Poona Collectorate, deducting the population of the city of Poona, there is one school to 3337 souls. It is fair to infer therefore, that as Dharwar supports proportionably so many more schools than the other collectorates, that information is more generally spread amongst the people, and that they are better able to manage their affairs than others less instructed ; and the breadth of cultivation, and general manufacturing and commercial industry of the people, would seem to justify the inference.—*Report of the Seventh Meeting of the British Association for the advancement of Science.*

(To be concluded in our next.)

X.—Proceedings of Societies.

Proceedings of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

Wednesday, 30*th January* 1839.

PRESENT.

The Honourable Sir Robert Comyn, *President in the Chair*

A. F. Bruce, Esq.
Robert Cole, Esq.
John Carnac Morris, Esq.
Rev. F. Spring,
Rev. W. Taylor,
and
J. Minchin, Esq. *Secretary.*

The Secretary submitted to the Meeting, statements of the Society's accounts for the past year.

Abstract Statement of the Funds of the Madras Literary Society and Auxiliary of the Royal Asiatic Society from the 1st *January to the* 31st *December* 1838.

	Disbursements			Receipts.		
Balance in favour of the Society as exhibited in the Statement submitted to the annual General Meeting held on the 31st January 1838	....	..	..	909	8	11
Total amount of Subscriptions received from the 1st January to the 31st December 1838	....	..	..	4875	11	7
Difference of interest in favour of the Society as stated in Messrs. Binny and Co.'s account closed on the 31st December 1838	....	..	..	22	8	0
Messrs. Binny and Co.'s commission on amount of receipts	48	12	1			
Remitted to Messrs. Wm. H. Allen and Co. booksellers	3130	6	10			
Pay of the Establishment	1594	10	0			
Postage	92	7	0			
Stationery	41	2	0			
Cooly hire	13	11	0			
Sundries	61	11	3			
Expenses incurred in binding books	35	8	5			
Subscription and postage for the Bombay Courier, &c	77	15	0			
Subscription and postage for the Bengal Herald, &c	23	12	6			
Books purchased at Madras	129	8	0			
Paid for printing advertisements, &c	29	0	0			
Paid Messrs. Ouchterlony and Co for salvage charges, &c. on one parcel of books saved from the wreck of the *Royal William* at the Cape	46	8	8			
	5325	0	9	5807	12	6
Deduct disbursements				5325	0	9
Balance in favour of the Society				482	11	9

Abstract Statement of the Funds of the Asiatic Department.

	Disbursements			Receipts.		
Balance in favour of the Society as exhibited in the Statement submitted to the General Meeting held on the 31st January 1838....	....	..	..	979	8	0
Total amount of Subscriptions received from the 1st January to the 31st December 1838.	....	..	..	1106	10	8
Amount realized by the sale of the Madras Journal of Literature and Science........	....	..	..	*1265	8	0
Difference of interest in favour of the Society as stated in Messrs. Binny and Co.'s account closed on the 31st December 1838...	....	..	..	26	15	5
Messrs. Binny and Co.'s commission on amount of receipts......................	23	11	7			
Paid for printing the 18th, 19th, 20th and 21st Nos. of the Madras Journal of Literature and Science............................	1376	12	0			
Pay of the Establishment.......	798	0	0			
Sundries..................................	47	0	6			
Paid Freight, &c. on four boxes of books to London.............................	25	11	0			
	2271	3	1	3378	10	1
Deduct disbursements				2271	3	
Balance in favour of the Society................				1107	7	0

The following donations having been made to the Society since the last annual general Meeting, the thanks of the Society were unanimously voted to the donors :—

10 Copies of Ancient and Modern Alphabets of the Southern Peninsula of India..........................	Madras Government.
2 Copies of Mr. Bruce's Report on the Manufacture of the Black Tea................................	ditto
5 Copies of Mr. Turnour's Mahawanso	ditto
Reports of a Committee for Investigating the Coal and Mineral Resources of India.......................	J. Prinsep Esq.
Khazanat ul ilm or the Treasury of Science..........	Bengal Asiatic Society.
A Catalogue of Sanscrit books.......................	ditto
Auber's Rise and Progress of the British Power in India, 2d vol..................................	Madras Government
Result of the Madras Observations for 1836 and 1837....	ditto
5 Volumes of Reports on the Poor Laws............	Captain F. Senior.
Recollections of the Deccan..........................	Captain T. J. Taylor.
Fort St. George Gazette for 1832, 1833 and 1834.......	J. C. Morris, Esq.
Government and Commerce of India.................	ditto
Hodgson on the Law and Police of Nepál.............	ditto

* Amount since realized and remitted to Messrs. Binny and Co. from the sale of the Journal Rupees 343.

Reeve's English and Canarese Dictionary............	College of Fort St. George.
Morris's English and Teloogoo Dictionary 1st vol....	ditto
Brown's Verses of Vémana..........................	ditto
Reeve's Canarese and English Dictionary............	ditto
Cural and Naladiyar (Tamil).........................	ditto
Cadamunjari (Tamil)..............................	ditto
A Snake preserved in a bottle......................	Z. Macaulay Esq.
A large beetle called the Bharine purugu	C. P. Brown Esq.
A mutilated Jain image............................	Lieut. Newbold.
Notice sur des Vêtements avec des Inscriptions Arabes, Persanes et Hindoustani—par M. De Tassy....	The Author.
Notice du Traité Persan sur les Vertus De Huçaïn Waïz Kaschifi, intitulé Akhlaqu—i Muhcini—par M. De Tassy....................................	ditto

It was announced that the following gentlemen have been elected members of the Society since the last Annual General Meeting :—

J. C. Wroughton, Esq.
C. R. Howard, Esq.
A. F. Arbuthnot, Esq.
J Cadenhead, Esq.
Dr. Murray,
Lieut. W. T. Nicolls,
Lieut. G. Balfour,
E. C. Heywood, Esq.
A. J. Cherry, Esq.
Major Alexander,
Rt Rev. The Lord Bishop of Madras,
Rev. A. C. Thomson,
Lt. Gen. Sir Jasper Nicolls, K. C. B.

During the past year the Society have lost 18 members by death, retirement or departure for Europe.

It having been ascertained that the name of Baron Von Hammer, who was several years ago elected an Honorary Member of the Society, has been inadvertently omitted from the list—it is

Resolved, that his name be duly entered, and that a letter of explanation be addressed to the Baron on the subject.

The Meeting proceed to elect three members for the Committee of Management for the ensuing year, in succession to the Rev. F. Spring, Walter Elliot Esq. and R. Cole, Esq. who go out by rotation: when Dr. Murray was duly elected, and the Rev. F. Spring and R. Cole Esq. re-elected.

Moved by the Honourable Sir Robert Comyn and seconded by J. C. Morris Esq.—That the thanks of the Society be given to the Rev. W.

Taylor for the manner in which the 2d and 3d volumes of the Restored Mackenzie Manuscripts have been prepared for the Society, and bound at his own expense—Carried unanimously.

The Rev. W. Taylor being present returns thanks.

Read letter from Lieut. Newbold, enclosing copies of manuscript inscriptions from the Ceded Districts.

Resolved, that the thanks of the Society be given to Lieut. Newbold, and that the inscriptions be referred to the Committee of Papers.

The Secretary to the Committee of Papers in the Asiatic Department announces that the Committee has associated with him, as joint Secretary, C. P. Brown, Esq. of the Civil Service, who undertakes that office to the Class of *Oriental Literature;* while he will continue to officiate in the *Physical Class.*

The business of the Meeting being concluded, the thanks of the Meeting were unanimously voted to the Honourable the President for his able conduct in the chair.

(Signed) J. Minchin.
Secretary.

(Signed) Robert Comyn.
President.

XI.—*Horary Meteorological Observations made agreeably with the suggestions of Sir* John Herschel, *at the Madras Observatory—By* T. G. Taylor, Esq. *H. E. I. C. Astronomer.*

Time	Barmo.	Thermometer. Dry.	Thermometer. Wet	Direction of wind.	Strength.	Remarks.
Dec. 21						
6 A. M.	30.106	71.1	68.0	———	calm	Flying clouds to the south.
7 ,,	30.116	71.6	68.6	———	calm	do. do.
8 ,,	30.150	73.7	70.6	N. W.	1	do. do.
9 ,,	30.159	76.4	70.6	E. N. E.	2	Clear.
10 ,,	30.158	78.1	70.9	Do.	2	do.
11 ,,	30.136	78.2	71.0	N.	2	Flying clouds.
12 ,,	30.108	78.9	71.0	N. E.	1	Clear.
1 P. M.	30.082	79.4	70.9	E.	2	do.
2 ,,	30.064	79.9	71.0	N. E.	2	do.
3 ,,	30.054	79.8	71.0	E. N. E.	2	Flying clouds.
4 ,,	30.050	79.8	70.5	N. E. N.	2	do. do.
5 ,,	30.058	78.8	70.5	N. E. N.	2	do. do.
6 ,,	30.068	77.2	70.1	N. E.	1	Clear.
7 ,,	30.076	76.4	69.7	N. E.	1	do.
8 ,,	30.092	76.0	69.6	N. E.	1	Flying clouds.
9 ,,	30.102	75.9	69.4	N. E.	1	do. do.
10 ,,	30.100	75.7	69.0	N. E.	1	do. do.
11 ,,	30.094	75.5	68.5	N. E.	1	do. do.
12 ,,	30.086	74.9	68.5	———	calm	do. do.
1 A. M.	30.074	74.5	69.4	N. E.	1	do. do.
2 ,,	30.058	74.4	69.3	N. E.	1	do. do.
3 ,,	30.050	73.6	67 5	N.	1	do. do.
4 ,,	30.050	72.8	68.0	N. W.	1	Clear.
5 ,,	30.048	72.0	68.0	N. W.	1	Flying clouds.
6 ,,	30.064	72.0	68.0	N. W.	1	do. do.
7 ,,	30.088	72.3	68.6	N. W.	1	do. do.
8 ,,	30.118	72.7	69.5	N. W.	1	Clear.
9 ,,	30.140	74.6	70.7	N. W.	1	Clear.
10 ,,	30.132	76.5	71.0	N. W. N.	2	Flying clouds.
11 ,,	30.124	77.8	70.0	N. E.	2	Flying clouds.
12 ,,	30.098	78.4	70.9	N. E.	1	Clear.
1 P. M.	30.078	79.4	70.7	E.	2	do.
2 ,,	30.062	79.9	70.8	N. E.	1	do.
3 ,,	30.051	80.0	71.0	N. E.	2	Flying clouds.
4 ,,	30.058	79.9	71.0	N. E.	2	do. do.
5 ,,	30.064	79.0	70.5	N. E.	2	Clear.
6 ,,	30.076	78.0	71.0	N. E.	1	do.

Horary Meteorological Observations made at the Summer Solstice, 1838, *at the Trivandrum Observatory.—By* J. Caldecott, Esq.

Date.	Hour.	Wrench's bar. corrected for temp. 32° and for capillarity.	Standard ther.	Dep. of W. B. Ther.*	Dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky and remarks.
June 21	6 A. M.	29.800	74.0	1·3	72.13	N W	2	No observations—on account of the Actinometer being out of order.	Sky obscured with thick cum.—cold wind.
	7	.807	75.0	1.1	73.43	N by W	2		do. at 7h. 30m. heavy rain.
	8	.808	77.5	1.2	75.83	N by W	2		Zenith clear; bank of cum. in N.W. horizon.
	9	.821	80.0	3.2	75.90	W	2		Fl. cl.; do. at 9h. 30m.—heavy rain.
	10	.824	80.5	2.9	76.49	S by W	6		Sky covered with cum. at 10h. 30m. do. with thunder.
	11	.839	75.8	2.5	72 21	N W by W	7		do. strong cold wind.
	Noon.	.822	75.9	1.8	73.34	N W	2		do. light cool air.
	1 P. M.	.800	76.8	2.1	73.83	N N W	2		do. do.
	2	.788	79 3	1.8	76.81	N N W	2		do. at 2h 30m rain.
	3	.778	77.5	2.4	74.12	N W	6		Somewhat clearer— fresh breeze.
	4	.766	78 3	1.7	75.95	N W	2		Cloudy and threatening.
	5	.780	79.2	3 3	74.58	W	4		do. do. at 5h. 30m. rain—cold wind.
	6	.791	76.8	2.7	72.95	W	5		Sky covered with nimbi—raining do.
	7	.820	75.3	1.4	73.30	N N W	3		do. do.
	8	.834	75.2	1.1	73.64	N N W	2		do. do. slightly.
	9	.844	75.5	0,8	74.37	——	0		do. calm.
	10	.864	75.5	0.9	74.23	N N W	3		do. at 10h. 15m. rain.
	11	·880	74.5	1.9	71.75	N W	10		do. rain with strong wind.
	Midn.	.880	74.0	0.4	73.43	N W	8		do. do. do.
„ 22	1 A. M.	.858	77.8	5.2	70.20	do	2		do do.
	2	.859	74.4	1.1	72.86	do	2		do. do. (slightly) lightn. in S.W.
	3	.839	74.2	1.1	72.62	N W by N	2		do. do
	4	.829	74.0	0.7	73.00	N W by W	2		do. do. lightn. in S.W.
	5	.818	74.5	0.9	73.22	——	0		do· calm.
	6	.833	74.4	1.3	72.53	N W by W	1		do a rain-bow at sun-rise, at
	7	.855	73.6	1.2	71.86	N W by W	1		do. [at 6h.30m. heavy rain.
	8	.865	75.3	1.2	73.59	N N W	4		do.
	9	.871	77.1	1.4	75.14	N N W	3		do.
	10	.911	77.3	2.8	73.33	W N W	12		do. raining with strong wind.
	11	.926	73.0	1.9	70.20	N W	8		do. do. fresh breeze.
	Noon.	.921	73.3	1.6	70.96	N W	6		do. raining slightly,—modr. breeze.
	1 P. M.	898	74.5	1.6	72.19	do	4		do. do. do.
	2	.851	77.0	2.7	73.16	do	3		Clearing gentle breeze.
	3	.816	77.0	3.0	72.71	N by W	4		Rather clearer do.
	4	.817	76.6	2.7	72.74	N W by N	2		Flying clouds light do.
	5	.807	76.5	1.7	74.10	——	0		Sky again obscured calm.
	6	.824	76.5	2.8	72.49	W	2		do. raining slightly, light breeze.

* Rain prevailed so much throughout these 36 hours, that these depressions indicate the temperature of the rain, rather than the hygrometric state of the atmosphere.

June 21st fall of rain from 6 A. M. to 6 P. M. 1·38
do 6 P.M. to 22d 6 A. M. 1·59
June 22d fall of rain from 6 A. M. to 6 P. M. 1·88

Total in the 36 hours 4.85 inches

The instruments are the same, and situated exactly as before.

Horary Meteorological Observations made at the Autumnal Equinox 1838, *at the Trevandrum Observatory.—By* J. Caldecott, Esq.

Date.	Hour.	Newman's Standard bar. corrected for temp. anacapillarity.	Standard ther.	Depress. of W. B. thermometer.	Dew point.	Direction of wind	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky, and remarks.
Sept. 21	6 A. M.	29.704	73.0	2.1	68.89	,,	,,	0.8	Zen. clear—cum. about hor. calm.
	7	.727	75.6	2.9	71.40	,,	,,	3.0	do. do. do.
	8	.745	79.1	4.1	7[illegible].29	N W	3	7.3	do. do. gentle wind.
	9	.761	82.1	6.1	73 52	W N W	6	2.5	Obscured. do.
	10	.759	84.0	7.9	72.85	do	4	0.5	do. do.
	11	.751	84.3	9.7	70.30	do	1	7.0	Fl. clds.—cum. about hor. light air.
	Noon.	.728	85.4	10.3	70.60	do	1	12.0	do. do. do.
	1 P. M.	.705	82.0	8.4	69.77	s w by w	1	0	Sky obscured with thick cl. do.
	2	.704	82.8	8.1	71.18	do	2	5.5	Clearing gentle wind.
	3	.693	83.9	9.6	70.00	w by s	2	8.5	Zen. clear—flying clouds do.
	4	.697	81.8	8.1	70.03	do	2	0	Cloudy and threatening do.
	5	.673	80.5	6 3	71.45	do	2	0.5	Clearer do.
	6	.698	79.2	5.9	70.64	s w	1		do. do.
	7	.722	78.4	4 4	72.10	N W	1		Light clouds in zen—cum. about western horizon light air.
	8	.741	78.1	4.0	72.38	,,	,,	No observations.	Drizzling and threatening calm.
	9	.777	77.8	3.7	72.51	,,	,,		do. do.
	10	.805	77.0	2.9	72.86	s w	3		Raining moderate breeze.
	11	.807	76.5	2.9	72.34	do	2		Overcast and threatening do.
	Midn.	.799	76.0	3.4	71.06	do	1		do. do. do.
,, 22	1 A. M.	.730	74.6	1.7	72.15	do	1		Raining almost calm.
	2	.711	73.6	1.2	71.86	W N N	2		Overcast at 2h. 45m. drizzling.
	3	.706	73.5	1.2	71.76	N W	1		Zen. clearing wind cold.
	4	.703	73.5	0.9	72.20	do	2		Clear do.
	5	.753	73.5	0.9	72.20	do	2		Overcast again.
	6	.759	73.5	1.2	71.76	do	1		do. at 6h. 45m. drizzling a rainbow.
	7	.758	74.5	0.9	73.22	do	1	3.2	Zen. clearing—otherwise cloudy.
	8	.782	77 9	2.6	74.24	W	2	5.0	Zen. clear—haze about horizon light breeze.
	9	.795	80.0	4.9	73.06	do	3	4.0	Light clouds about E. hor. otherwise cloudy moderate do.
	10	.789	82.0	6.1	73.41	do	2	5.0	do. do. do.
	11	.757	84.0	8.6	71.75	W S W	3	12.8	Quite clear do.
	Noon.	.750	85.2	9.6	71.52	W by s	4	12.0	do. wind increasing.
	1 P. M.	.706	86.3	10.9	70.68	do	8	11.1	do. fresh breeze.
	2	.787	86.0	10.0	70 15	do	8	8.1	do. do.
	3	.674	85.4	10.5	70.27	W S W	9	1.1	do. do.
	4	.673	84.5	9.4	72.23	do	8	1.9	Flying clouds in zen. do.
	5	.698	82.6	8.5	70.30	S W	4	0.2	Clear in the zen. clouds about S. horizon gentle breeze.
	6	.727	80.5	6 9	70.49	W	4	,,	do. do. do.

The barometer is a Standard one by Newman (having an half inch tube) which has lately been received in excellent order—it is placed in the situation of the former one. The other instruments are the same as before.

September 21st fall of rain from
6 A. M. to 6 P. M. None
do. 6 P. M.
to 22d to A. M. .1010
September 22d do.
6 A. M. to 6 P. M. None
Total in the 36 hours.0.1010 inches.

Horary Meteorological Observations made at the Winter Solstice, 1838, at the Trevandrum Observatory.—By G. SPERSCHNEIDER, *Superintendent.*

Date.	Hour.	Newman's Standard bar corrected for temp. and for capillarity.	Standard ther.	Depress of wet bulb thermometer.	Dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky, and remarks.
Dec. 21	6 A. M.	29.767	67.4	7 9	53.70	N E by N	3		Sky clear—cum. about the N. E. horizon gentle wind.
	7	.790	69.0	8.3	54.87	do	4		do. do. cold wind.
	8	.815	73.0	9.4	58.61	do	1	4.6	do do. wind hardly percept.
	9	.817	79 5	13.2	57.95	N E	2	6.0	do. do. do. just perceptible.
	10	.802	82 5	15.4	57.38	do	3	7.5	do. do gentle wind.
	11	.783	83 8	15.4	59.15	E N E	2	4.5	do. clear, cum. about the E. hor do.
	Noon.	.753	85 9	16.9	58 81	W	1	2.0	do. do. nearly calm.
	1 P. M.	.729	86 4	14.5	64.20	S W	5	5.8	do. do. gentle wind.
	2	.705	85.8	14.7	63.04	S W by S	10	6.1	do. do. pleasant brisk gale.
	3	.69[illegible]	85·2	13.9	63.77	S W	10	2.5	do. strata in the N. do.
	4	.704	84.4	12.9	64.64	S by W	8	1.5	Sky clear do.
	5	.716	82.6	12.5	63 09	S W	1		do. wind hardly percept.
	6	.724	80.6	10.7	63 93	,,	,,		do. nearly calm.
	7	.732	79.3	9 8	63.99	,,	,,		do. do.
	8	.747	77.0	8 1	64.30	,,	,,		do. do.
	9	.769	75.5	9.2	61.85	N	1		do. wind hardly percept.
	10	.779	72.4	5.0	64.47	,,	,,		do. calm.
	11	.776	70.6	3.8	64.54	N E	1		do wind just perceptible.
	Mid.	.761	71.0	4.2	64.30	do	1	No observations.	do. do.
22	1 A. M.	.752	69.0	3.4	63.54	do	2		Sky pretty clear cold wind.
	2	.737	68.5	3.4	63.04	do	2		do. do.
	3	.736	67 0	2.9	62.31	,,	,,		do. calm.
	4	.736	67.0	4 4	59.77	N E	3		do. do.
	5	.750	66.5	5.3	57 65	N E by N	4		do. do.
	6	.761	66.2	5.3	57 33	N N E	4		Sky covered with light clouds do.
	7	.781	67.7	5.8	58.11	do	1	1 3	do. wind hardly perceptible.
	8	.791	73 4	8.6	59.27	do	2	2.5	do. do. just do.
	9	.810	78.9	14.1	59 38	do	1	6.0	do. wind hardly do.
	10	.805	82.4	15.3	57.45	N N W	1	9.0	do. do.
	11	.782	84 3	17.0	55.50	N	1	9.5	Sky clear, do.
	Noon.	.748	86.8	19.3	55.05	S W	2	12.5	do. wind just perceptible.
	1 P. M.	.716	87.5	19.2	56.25	do	3	6 7	do. gentle wind.
	2	.695	87.5	18.8	57.08	do	3	3.8	do. do.
	3	.686	85.7	17.2	59.22	W	3	4.5	do. do.
	4	.689	85.6	16.5	59.21	do	2	3 3	do. do.
	5	.722	84.1	14.8	60.60	W S W	1	2.5	do. do.
	6	.741	81.4	12.3	61.94	W	1		do. do.

No thunder, lightning nor rain throughout.

The instruments are situated exactly as before.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF OCTOBER, 1838.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind 10 A. M.	Direction of Wind 4 P. M.	Direction of Wind 10 P. M.	Weather 10 A. M.	Weather 4 P. M.	Weather 10 P. M.	Remarks.
1838	Inch.	Inch.	Inch.	°	°	°	°	°	°										
Oct. 1	29,990	29,902	29,952	85,7	91,0	83,6	5,8	7,5	4,1	....	....	....	SW	SE	SE	Clear	Clear	Clear	Lightning.
2	,980	,904	,968	86,8	91,0	84,3	7,6	8,0	4,0	....	....	....	W	SE	SW	Clear	Clear	Cloudy	Do.
3	30.004	,934	30,012	87,9	87,7	86,0	9.6	7,7	5,1	....	....	2,476	W	EbySE	SW	Cloudy	Cloudy	Cloudy	Thunder and lightning.
4	,036	,960	,044	86,2	86,0	84,6	5,9	5,5	4,2	....	....	....	S	S	W	Fl. cl.	Cloudy	Cloudy	Do. Do.
5	,060	,976	,038	86,3	89,4	84,5	9,1	5,9	4,5	....	0,321	....	W	EbySE	S	Clear	Th. hz.	Cloudy	Do. Do.
6	,064	,976	,038	86,3	92,0	82,6	7,5	10,0	3,3	....	....	....	N	SE	SE	Fl. cl.	Clear	Clear	Do. Do.
7	,056	——	,030	86,0	——	82,0	6.3	——	3,6	....	....	....	SE	——	S	Fl. cl.	— ——	Clear	—— Do.
8	,038	,990	,040	85,5	87,6	82,5	6,5	9,1	4,6	....	....	....	SW	SEbyS	SE	Clear	Clear	Clear	—— Do.
9	,046	,990	,040	84,8	87,8	83,5	7,1	8,8	7,3	....	....	....	NW	E	SE	Fl. cl.	Clear	Clear	—— Do.
10	,040	,976	,034	85,3	87,6	80,7	8,1	10,1	5,2	....	....	2,646	E	E	E	Fl. cl.	Clear	Clear	Dew ——
11	,046	,970	,028	84,7	87,8	81,8	6,7	10,0	4,8	....	....	....	S	E	E	Clear	Th. hz.	Clear	Lightning—dew
12	,034	,950	,008	85,7	87,4	83,4	10,0	8,3	5,1	....	....	....	S E	E	E	Fl. cl.	Clear	Clear	Do. Do.
13	,038	,964	,016	85,8	86,5	84,5	6,1	7,8	5,4	....	....	....	E	E	E	Fl. cl.	Th. hz.	Clear	Do. ——
14	,016	——	29,992	81,2	——	81,2	4,2	——	4,2	....	0,347	....	SW	——	NE	Cloudy	——	Fl. cl.	Do.
15	,012	,952	,986	79,5	81,0	79,2	2,2	6,0	2,5	....	0,397	....	N	NW	N	Cloudy	Cloudy	Cloudy	Do.
16	,008	,942	,970	78,6	76 6	78,5	3,4	3,7	3.7	0,087	0,437	....	N	N	NW	Cloudy	Dr.rain	Cloudy	Do.
17	29,922	,892	,916	78,1	81,0	78,3	4.1	8,2	4,7	....	....	1,539	SW	W	SW	Cloudy	Cloudy	Cloudy	——
18	,964	,882	,930	81,8	85,8	80,7	7,9	10,5	4,6	....	....	....	W	SW	SW	Haze	Th. hz.	Haze	——
19	,960	,900	,956	83,7	86,5	83,8	8,0	8,5	2,8	....	....	....	W	S	S	Clear	Clear	Fl. cl.	——
20	30,000	,940	30,000	84,2	87,6	83,9	6,2	9,1	3,3	....	....	....	SW	S	S	Clear	Cloudy	Clear	
21	,046	——	,044	84,8	——	84,8	5,6	——	1,8	....	....	....	W	——	S	Clear	——	Cloudy	Lightning
22	,096	30,056	,086	85,1	85,6	82,5	7,1	7.1	3,5	....	....	....	SE	SE	SE	Haze	Cloudy	Fl. cl.	——
23	,106	,026	,100	83,9	86,5	82,7	6,4	8,5	6,3	....	....	....	SW	E	SE	Fl. cl.	Cloudy	Fl. cl.	——
24	,010	,028	,062	83,3	85,0	82,0	6,8	10,0	8,0	....	....	2,301	NE	NE	NE	Fl. cl.	Clear	Haze	
25	,074	,000	,024	84,0	85,0	80,3	9,7	9,8	5,6	....	....	....	NE	E	N	Clear	Clear	Clear	Lightning to the east.
26	,022	29,974	,000	81,7	84,0	82,5	6,2	10,0	6,5	....	....	....	NE	NE	N	Cloudy	Cloudy	Cloudy	Thunder and lightning to the E.
27	,018	,948	29,994	79,3	81,6	79,5	1,1	——	3,5	1,174	0,467	....	N	——	N	Dr.rain	——	Dr.rain	Do. Do.
28	,008	——	,998	78,6	——	79,3	2,1	——	3,0	0,367	0,535	....	NNE	——	N	Do.	——	Fl. cl.	Lightning.
29	,036	,960	30,018	78,6	80,0	78,7	1,3	2,5	2,0	0,147	....	....	N	N	NW	Do.	Cloudy	Cloudy	Do.
30	,068	,990	,056	79,0	79,4	78,2	2,2	2,9	2,0	0,934	0,117	....	E	N	N	Cloudy	Cloudy	Cloudy	Do.
31	,040	,980	,024	78,7	79,6	79,4	1,5	2,6	1,7	0,944	....	1,550	N W	N	N	Th. hz.	Cloudy	Fl. cl.	——
Mean	30,027	29,962	30,013	83,3	85,4	81,9	5,9	7,6	4,2										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF NOVEMBER, 1838.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.	Remarks.
1838	Inch.	Inch.	Inch.	°	°	°	°	°	°										
Nov. 1	30,016	29,978	29,990	80,4	82,5	78,5	3.4	5,0	2,	0,217	......	......	NE	NE	Calm	Cloudy	Fl. cl.	Clear	Heavy dew.
2	,008	,958	30,000	80,7	83,8	79,9	2,7	6,8	4,2	......	......	......	NW	NE	NE	Cloudy	Haze	Haze	Dew.
3	,008	,954	29,998	81,4	84,0	80,3	3,4	5,5	2,0	......	......	......	NW	NW		Fl. cl.	Fl. cl.	Dr. rain	Thunder and lightning.
4	,024	——	30,000	78,0	——	78,9	2,0	——	1,0	0,667	0,167	......	NE	——	NW	Rain	——	Do.	Lightning and thunder.
5	29,990	,930	29,976	77,6	76,2	76,4	1,9	1,7	2,2	5,009	0,637	......	N	NW	N	Cloudy	Cloudy	Do.	Squally ——
6	,948	,910	,906	76,5	77,0	76,5	0,8	1,6	1,7	1.382	0,994	......	NE	NW	N	Cloudy	Rain	Calm	Drizzling rain—heavy rain.
7	,920	,875	,91	77,7	79,8	78,4	1,3	3,8	1,4	4.700	......	1,304	SW	SE. E	E	Cloudy	Th. hz.	Clear	Vivid lightning.
8	,952	,890	,940	80,7	81,8	79,1	3,2	3,8	1,9	0,067	......	......	E	E	NE	Fl. cl.	Cloudy	Cloudy	Do. and one loud and terrific [crash of th.
9	,956	,902	,958	80,1	82,0	79,9	2.2	4,0	2,5	3,825	0.037	......	E	E	NE	Cloudy	Cloudy	Fl. cl.	Lightning.
10	30,034	,914	30,000	78,2	79,0	78,3	3,2	3,0	1.1	1.044	0,067	......	E	E	NW	Cloudy	Cloudy	Dr. rain	Lightning.
11	,033	——	,003	78,8	——	79,8	0,8	——	1,4	1,534	0,107	......	N. NW	——	N	Cloudy	——	Fl. cl	Thunder and lightning.
12	,063	,964	,028	78,2	79,4	78,3	1,7	1,9	1,9	0,127	0,147	......	E. SE	E	N	Rain	Cloudy	Cloudy	Do. Do.
13	,076	,990	,064	81,8	81.4	79,7	3,3	4,9	3,2	0,247	......	......	NE	E	NE	Fl. cl.	Cloudy	Clear	Lightning.
14	,090	30.000	,090	81,6	79,9	79,7	3,9	3,9	2,5	......	......	1,066	NE. E	NE. E	NE. E	Fl. cl.	Cloudy	Rain	Thunder and lightning.
15	,124	,006	,068	77,5	79,9	78,3	1,5	3,4	2,2	0,187	0,377	......	N	N	NE	Cloudy	Dr. rain	Clear	Lightning.
16	,102	,002	,088	81,1	80,5	79,5	3,3	4,0	2,9	......	......	......	NE	NE	NE	Fl. cl.	Cloudy	Fl. cl.	Do.
17	,110	,022	,078	80,8	80,8	79,3	5,0	5,8	4,3	......	......	......	NE	NE	NE	Clear	Fl. cl.	Fl. cl.	——
18	,076	——	,076	78.8	——	77,7	5,1	——	2,7	......	......	......	——	——	NE	......	——	Clear	——
19	,067	,012	,056	79,5	79,4	77,6	7,1	6 9	4,7	......	......	......	E	NE	N	Fl. cl.	Fl. cl.	Haze	——
20	,030	29,958	,003	78,2	80,0	78.0	5,7	2,0	1,7	......	......	......	N	N	Calm	Fl. cl.	Fl. cl.	Th. hz	——
21	29,982	,940	29,952	76,3	78,8	74,7	4,3	2,3	2,3	......	......	1.620	N. NW	N	Calm	Th. hz.	Th. hz.	Clear	Heavy dew.
22	30,014	,960	30,006	76,9	79,6	76,0	4,6	10,1	3,5	......	......	......	N. NW	NE	Calm	Th. hz.	Th. hz.	Haze	Do. Do.
23	,062	,974	,033	77,2	79,5	73,5	4,9	6,5	4,5	......	......	......	W	NE. E	Calm	Haze	Haze	Clear	Do. Do.
24	,088	,985	,035	76,4	79,5	76,0	5,5	7,5	6,3	......	......	......	N	NE	NE	Clear	Clear	Clear	Do. Do.
25	,077	——	,054	77,2	——	75,7	6,2	——	5,7	......	......	......	E	——	N	Clear	——	Clear	Do. Do.
26	,100	30,004	,086	77,3	78.0	76,3	5,3	6,5	3,3	......	......	......	N	NE	NE	Cloudy	Cloudy	Cloudy	——
27	,112	,046	,126	79,1	80,4	77,3	4,1	5,9	2,3	0,147	......	......	NE	E	NE	Fl. cl.	Fl. cl.	Fl. cl.	——
28	,156	,072	.140	76,3	79,0	78.2	1,8	4.0	3,9	0,091	......	1,990	NW	NE	NE	Fl. cl,	Cloudy	Fl. cl.	——
29	,126	,042	,124	79,0	78,8	76,5	4,7	4.8	2,1	......	......	......	N	E. NE	E. NE	Fl, cl.	Dr. rain	Rain	——
30	,120	.042	,114	78.3	78,8	77,5	4,2	5,3	4,9	0,117	......	......	N. NE	N. NE	NE	Cloudy	Cloudy	Fl. cl.	——
Mean	30,049	29,974	30,030	78,7	80,0	77,9	3,6	4,6	2,9										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MO[illegible]

1838	Barometer at			Ther. at			Wet Bulb.			Rain.			Direction of Wind.			Weather.			Remarks.
Days.	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	Sun-rise.	Sun-set.	Evaporation.	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	
	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Dec. 1	30,105	30,016	30,072	77,8	78,5	75,7	6,3	9,0	7,3	......	......	......	E N E	N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	
2	,086	—	,068	76,0	—	76,1	5,6	—	3,1	......	......	......	N W	—	N W	Fl. cl.	—	Cloudy	
3	,058	29,990	,008	77,8	78,8	77,8	3,8	4,4	2,3	......	......	......	N. N W	N. N W	N	Haze	Cloudy	Cloudy	
4	,016	,944	29,978	78,7	79,8	76,7	3,5	4,8	2,4	......	......	......	N W	N W. N	N	Fl. cl.	Fl. cl.	Cloudy	
5	29,968	,934	,944	76,1	78,0	76,4	2,2	3,0	1,8	0,190	0,317	1,958	N	N	N	Rain	Cloudy	Cloudy	[night thr. & lig.
6	,950	,874	,905	75,1	76,5	75,7	1,5	2,1	1,1	1,781	0,232	......	N. N W	N. N W	N. N W	Rain	Rain	Cloudy	Strong wind or light gale at
7	,893	,910	,993	75,8	76,8	76,7	0.7	1,8	0,7	1,634	0,067	......	W. N W	S	S E	Rain	Cloudy	Cloudy	Lightning.
8	30,084	,988	30,050	78.8	81,0	77,8	1,5	4,0	1,7	......	......	......	E. S E	S E	E. N E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
9	,062	—	,050	78.8	—	77,7	2,8	—	4.6	......	......	......	N E	—	N E	Fl. cl.	—	Fl. cl.	Do.
10	,090	30,004	,198	78,7	80,0	77,8	4.0	6,0	4.6	......	......	......	E	E	N	Fl. cl.	Fl. cl.	Fl. cl.	—
11	,120	,042	,112	78 6	78,6	76,6	4,6	5,1	3,0	......	......	......	S E	N. N E	N	Fl. cl.	Cloudy	Clear	—
12	,126	,042	,104	77,7	78,6	75,4	2,3	3,6	2,3	......	......	2,063	N	N E	N	Fl. cl.	Fl. cl.	Clear.	Dew.
13	,116	—	,070	77,8	—	76,3	3,2	—	2,0	......	......	......	N	—	N E	Fl. cl.	—	Fl. cl.	Do.
14	,080	—	,064	78,3	—	76,8	3,4	—	2,2	......	......	......	E	—	N	Fl. cl.	—	Fl. cl.	Do.
15	,116	30,010	,119	78,5	81,4	78,3	2,9	6,4	2,3	......	......	......	E	N E	N	Fl. cl.	Fl. cl.	Fl. cl.	Do.
16	,152	—	,142	79,8	—	78,0	3,7	—	4,4	......	......	......	E	—	N E	Fl. cl.	—	Clear	Do.
17	,192	,104	,150	79,7	80,0	77,1	6.7	9,5	7.0	......	......	......	E. N E	E. N E	N E	Fl. cl.	Fl. cl.	Clear	Do.
18	,150	,074	,134	78,1	79.0	76,0	6,8	8.0	6,1	......	......	......	E. N E	N	N E	Clear	Clear	Fl. cl.	Do.
19	,128	,064	,132	76,9	78.5	74,4	5,5	7.5	5,1	......	......	1,027	N E	N E	N E	Cloudy	Haze	Clear	Heavy dew;
20	,150	,064	,140	75,6	78,5	75,3	4.9	8.0	4.9	......	......	......	N W	N E	N	Fl. cl,	Fl. cl.	Fl. cl.	Do. do.
21	,158	,050	,100	78,1	79.8	75,7	7,2	9,3	6,7	......	......	......	E. N E	N E. N	N E	Clear	Fl. cl.	Fl. cl.	Dew.
22	,132	,058	,146	76,5	79,9	75,6	5,5	8,9	5,1	......	......	......	N W. N	N E	N	Fl. cl.	Fl. cl.	Fl. cl.	Heavy dew.
23	,134	—	,112	76,8	—	75,0	6,1	—	6,1	......	......	......	N W	—	E	Fl. cl.	—	Fl. cl.	Dew.
24	,138	,066	,104	77,1	79,4	75,9	7.1	8,4	6,1	......	......	......	N E	N E	N E	Fl. cl.	Fl. cl.	Clear	Heavy dew.
25	,124	—	,112	75,7	78.0	74.8	4.8	8,0	3,3	......	......	......	N. N W	N E	N	Fl. cl.	—	Fl. cl.	Dew.
26	,140	,083	,157	78,0	78.0	76.9	4,0	8.0	4.4	......	......	1,227	N by E	N E	N E	Cloudy	Fl. cl.	Fl. cl.	—
27	,158	,082	,121	78,0	78,0	78.0	4.0	3,9	2,5	......	......	......	N	N E	N E	Clear	Showry	Cloudy	
28	,170	,058	,120	77.5	83,0	77,8	3,5	8.5	3,6	......	......	......	N by E	N E	N E	Clear	Fl. cl.	Fl. cl.	
29	,178	,084	,160	78,0	78,8	76.8	4,8	4,1	6,0	......	......	......	N E	N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	
30	,174	,080	,134	77,5	79,0	77,7	4,0	7,0	3,7	......	......	......	N E	N E	N N E	Fl. cl.	Fl. cl.	Fl. cl.	
31	,138	—	,092	77,7	—	78,2	4.1	—	4,2	......	......	......	N. N E	—	N E	overcast	—	Clear	
Mean	30,106	30,028	30,087	77.6	79,1	76.7	4.2	6,2	3.9										

The Instruments with which the foregoing observations are made, are placed in the Western Verandah of the Honourable Company's Observatory; at about 5 feet above the surface of the ground, and 27 feet above the level of the Sea.

The barometer employed is No. 1, one of two Standards which I had constructed at the end of the year 1836, to supply the place of those broken during the storm: the indications set down are those immediately read off from the instrument, and consequently require in addition to the ordinary correction for temperature, the correction +,051 for capillarity: from a late comparison of these with a magnificent standard by Newman which had been constructed with all the advantages of modern improvement for the Trevandrum Observatory, it appeared that when *corrected for capillarity*, the

Trevandrum Standard stood at		30,000	inches.
the Madras	No. 1	30,001	do.
	No. 2	29,993	do.

The thermometer was made on purpose for the Observatory, and at 75° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard:

	h.	*m.*	*s.*	
Longitude	5	21	8	E.
Latitude	13°	4	8,5	N.

T. G. Taylor,
H. C. Astronomer.